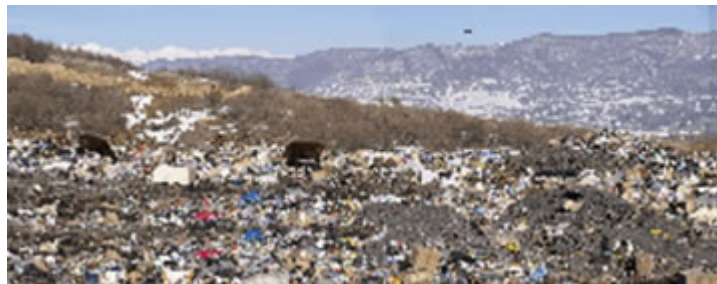


# Waste Management Assessment

Tskhinvali, South Ossetia



## SUMMARY REPORT

May 2008



# TABLE OF CONTENTS

## Disclaimer

*This report has been prepared under the auspices of the Environment and Security Initiative (ENVSEC initiative) and is managed by UNEP/GRID-Arendal. ProAct Network and Disaster Waste Recovery were requested to provide technical advice with regards to waste management in the specified region. The views expressed herein are those of the consultants and therefore in no way reflect the official opinion of the OSCE, UNEP or representatives from the governments. Designations employed and the presentation of material in this report do not imply the expression of any opinion on the part of the organisations concerning the legal status of any country, territory, city or area of its authority, or delineation of its frontiers or boundaries.*

1.1	Waste Management in Conflict and Post-conflict Situations	1
1.2	The Geographical Setting	1
1.3	Waste Management Overview	1
1.4	Objective of this Review	2
<b>2.</b>	<b>MAIN FINDINGS ON WASTE MANAGEMENT</b>	<b>3</b>
2.1	Primary Sources of Waste	3
2.2	Waste Management Systems	5
<b>3.</b>	<b>RECOMMENDATIONS</b>	<b>8</b>

## **ABBREVIATIONS AND ACRONYMS**

ENVSEC	Environment and Security Initiative
EU	European Union
km <sup>2</sup>	square kilometre
l	litre
m <sup>2</sup>	square metre
m <sup>3</sup>	cubic metre
Mg	Metric ton
NGO	non-governmental organisation
OSCE	Organisation for Security and Co-operation in Europe
RUB	Russian Rouble
UNEP	United Nations Environmental Programme

## **ACKNOWLEDGEMENTS**

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## EXECUTIVE SUMMARY

The southern Caucasus region has experienced significant environmental degradation as a result of conflict. An assessment and consultations undertaken by the Environment and Security Initiative (ENVSEC) in 2004 signalled the need to address environmental problems in South Ossetia that have resulted due to conflict. The same review noted how an improvement in this situation could likely make a positive contribution to ongoing peace building efforts in the region.

Improper waste management was noted as a key concern, with concern raised both on account of this being a direct health risk and a barrier to development and peace-building in this region.

At the request of authorities in South Ossetia, and in close co-ordination with the Economic Rehabilitation Programme in South Ossetia, the Organisation for Security and Co-operation in Europe (OSCE) and UNEP/GRID-Arendal commissioned a field mission to the region to examine the current status of waste management in and around Tskhinvali, the largest city of South Ossetia. The results of this mission – conducted with representatives from the OSCE, UNEP/GRID-Arendal, ProAct Network and Disaster Waste Recovery – are described in the summary below.

Mission objectives were to:

- estimate the quantity and type of waste, as well as the main sources and current location of waste;
- assess the capacity of local and regional communities to deal with waste, as well as the skills and capabilities of local organisations to handle waste;
- provide recommendations for the handling, recycling, re-use, treatment and disposal of each waste stream, taking into account livelihood opportunities and possible employment generation; and
- develop an implementation plan for each of the above recommendations.

Five sites were visited during this mission. The scope of the waste assessment included household, industrial, medical and hazardous waste, as well as waste from selected peace keeping camps. It did not, however, consider potential military or heavy industrial waste.

Waste management in South Ossetia, in general, can be considered as a significant problem both across the city as well as in surrounding areas. Key findings from the mission are as follows:

1. Immediate clean-up is needed for sites with identified hazardous waste.
2. Immediate measures are needed to improve the handling and disposal of hazardous and medical waste.
3. Development of a waste processing facility is needed. Broad-scale waste segregation, recycling and composting would be highly beneficial in terms of reducing the actual volume of waste, with associated by-product benefits.

4. Improved debris management is required to produce raw materials and reduce risks related to damaged houses.
5. Measures are urgently needed to improve waste collection and management – from improved fleet management to payment fee structures, record keeping and management capacity.
6. Institutional capacity needs to be strengthened – with associated policy development – in relation to waste management.
7. The existing landfill site needs considerable remediation, both in terms of access and safety.
8. New suitable sites needs to be selected in order to develop long term sanitary disposal strategies

Two broad recommendations stem from this mission (with associated activities – see Section 3 for more details):

1. **Improved Awareness Raising and Regional Collaboration.**
2. **Mitigate Immediate Risks Associated with Waste** through:
  - waste collection and removal;
  - waste treatment;
  - hazardous waste management;
  - site remediation; and
  - technical assistance and capacity building.

Proposed actions to address both recommendations could be addressed in a modular manner, allowing one or several items to be implemented depending on resources and political circumstances. However, all actions should include capacity development measures to ensure sustainability of the solutions.

# **1. INTRODUCTION**

## **1.1 Waste Management in Conflict and Post-Conflict Situations**

The effective management of waste is often impeded by conflict, or the results thereof. In the short-term, conflicts generate waste such as demolition rubble and unexploded ordinance. Additional waste may result from camps established to cater for internally displaced people, as well as camps established for peace keeping forces.

Conflicts may also disrupt municipal waste collection and disposal systems and impede needed investments in waste management infrastructure and services. The latter includes the development of waste policies and strategies, the maintenance of equipment and disposal facilities and the availability of trained personnel.

In situations such as those experienced in South Ossetia, the breakdown of waste management systems has exposed many public health and livelihood concerns. This has been further exacerbated by the absence of safe and appropriate management practices for domestic, industrial and hazardous wastes.

The situation need not necessarily be like this, however, as the development of waste management programmes during the peace-building process can represent an opportunity to establish appropriate waste management systems for former and current waste loads. It can furthermore help address future needs, which is an important consideration given that peace often results in economic investment in the industrial, commercial, mining and/or tourism sectors.

Engagement in many post-conflict waste management situations has demonstrated the need for focused waste support to assist with the peace-building process. Additional experience has, at the same time, shown that reconstruction and investment in post-conflict regions can present new environmental challenges and opportunities, including the need for capacity building in urban planning and with regard to industrial developments such as roads and power stations.

In the case of South Ossetia, local authorities and civil society have identified waste management as a high priority concern in and around the city of Tskhinvali. In recognition of this and the possibility of using the waste issue to further peace building, UNEP Grid requested ProAct Network to undertake a rapid assessment of the situation in and around Tskhinvali, specifically to identify key issues, needs and opportunities. A resulting mission, conducted in collaboration with a consultant from Disaster Waste Recovery (DWR), was conducted from 16-26 March 2008.

## **1.2 The Geographical Setting**

South Ossetia is located on the southern slopes of the central part of the Caucasus ridge. It covers an area of approximately 3,800km<sup>2</sup>, representing more than five per cent of the Georgian territory. South Ossetia consists of four regions: Tskhinvali in the south, Znauri in the west, Akhagori (Leningori) in the east, and Djava in the north. The scope of this mission and report relates to Tskhinvali and its surroundings.

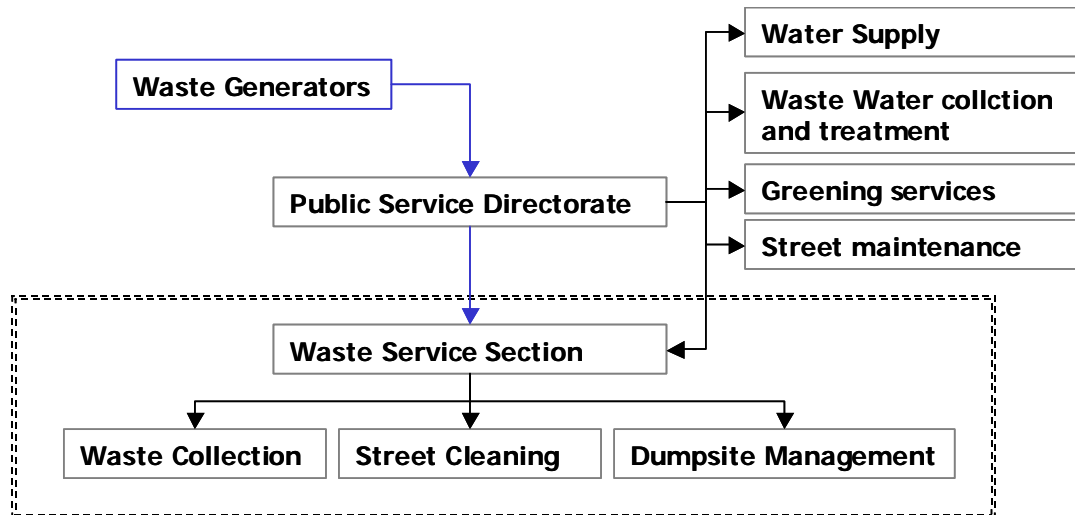
According to local authorities, the population of Tskhinvali is estimated at around 38,500 inhabitants, with little signs of growth.

Technical data on the hydrogeology, topography, climate, hydrology, geology and soils, land use and agriculture of the study area are given in the main technical report.

## **1.3 Waste Management Overview**

An organigram showing the respective roles and responsibilities in relation to waste management is presented below.

The total amount of waste produced each day in Tskhinvali totals 18.1Mg<sup>1</sup>, which is equal to between 105-110m<sup>3</sup>/day. The city's Waste Service Section is responsible for the collection, transport and disposal of waste, as well as street cleaning. The budget for such work is managed according to fee payments from the Public Service Directorate. The system is cost-profit based and provides a good basis for commercialisation. At present, however, collected fees are thought to amount to around €7,000 per month. A subsidy of 100 per cent is therefore required from the government to effectively cover waste management and cleaning costs.



#### 1.4 Objective of this Review

The main objectives of a conflict or disaster waste management system, within the humanitarian context, are generally to:

- reduce public health risks through the sound and environmentally safe handling, removal and disposal of daily generated wastes in conflict zones;
- assist local authorities in establishing and maintaining sound waste management policies and procedures;
- implement revenue generation initiatives from waste management;
- provide a process for the safe and sound management of hazardous and contaminated wastes, including clinical wastes and contaminated soils;
- provide local employment and training within the waste management system, through collection, sorting and recycling; and
- contribute positively towards the psychological image of the damaged areas by accelerating the waste clean-up process and assisting with the rehabilitation and reconstruction process.

These objectives have been integrated into recommendations included in this report.

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<sup>1</sup> Mg = new ISO unit for metric ton

## **2. MAIN FINDINGS ON WASTE MANAGEMENT**

### **2.1 Primary Sources of Waste**

This assessment focused on direct and indirect waste streams. Direct waste stream materials included:

- household-related waste;
- hazardous waste, including medical waste;
- industrial waste such as existing industries and waste streams, waste from former industries and waste from industries impacted due to the conflict, for example oil storage facilities;
- waste from street cleaning;
- peace keeping force camp waste;
- debris and rubble;
- IDP camp – mainly shelter – waste; and
- sewage sludge.

Indirect waste stream materials included:

- debris and rubble from resettlement and the restoration of conflict-impacted buildings, infrastructure and facilities; and
- post-conflict military waste.

The main current waste streams are household- and reconstruction-related wastes. While a waste collection system is in place within Tskhinvali, most of the rural areas are without any waste service collection, which has resulted in waste being dumped in backyards or near and/or into rivers.

No official figures are available on the composition of household waste. An assumption of the amount of waste, however, is described in the main technical report accompanying this summary.

#### **2.1.1 General Sources**

Additional information is provided below on some of the original sources of waste. In addition to an accumulation of scrap cars, hazardous components have been identified at many locations, including medical waste and asbestos roof sheets, oil contaminated packages and filters. A rough estimate suggests a need for clean-up of around 4,100m<sup>3</sup> construction waste and 80-100m<sup>3</sup> of abandoned vehicles. The composition of the construction waste does not allow for extensive recycling activities. The material could, however, be used as infill material for remediation activities at the current disposal site.

#### **Peace keeping force camps**

Information from the Peace Keeping Forces shows that local service providers take care of the waste from each camp. This, however, is only valid for the area around Tskhinvali city: other areas do not receive a proper service.

#### **IDP Camps and Conflict-relief Waste**

No camps have been established for internally displaced people, according to state officials. East of the river, however, numerous displaced families have been located in high rise residential buildings. Waste from such facilities are included in the daily city household waste collection.

#### **Waste from street cleaning activities**

Four different sets of street sweeping machines were identified on the parking lot of the municipal waste service provider. None of the machines were functional, mainly on account of missing parts. Current street conditions, however, would in any case not allow the use of such equipment.

Eighty workers (2 per cent of whom are female) manually clean the streets of Tskhinvali on a daily basis. The amount of waste collected daily from street sweeping activities was estimated at approximately 10-20m<sup>3</sup> per day, with a density of 650kg/m<sup>3</sup>.

Manual street sweeping, however, also guarantees employment which is probably an important socio-economic consideration in this particular situation. In addition, the use of mechanical equipment is far more expensive than labour forces. As the streets of Tskhinvali are relatively clean, this system is deemed to be currently sufficient and should be maintained as such.

#### Observations

- ✓ Streets in the city are sufficiently clean.
- ✓ Employment for the purpose of street cleaning results in positive socio-economic impacts.
- ✗ Workers are not properly protected.
- ✗ Mechanical equipment is out of order – spare parts are missing.
- ✗ Current street conditions do not allow mechanical equipment to be used.

### 2.1.2 Special waste streams

#### Hazardous waste

The main hospital, with a capacity of 200 beds, is located in Tskhinvali city. Renovation is expected to take place in the near future with support from ERP/OSCE programmes. Waste collection from the hospital is currently performed by the municipal waste service provider and disposed into the existing dumpsite.

According to international standards, a waste production of 2kg/bed and 0.2kg/staff can be assumed on a daily basis. A total waste amount of 415kg can therefore be considered. According to previous experience, around 85 per cent of this waste stream is non-hazardous; 30 per cent is recyclable; 15 per cent is of a hazardous origin; and 80 per cent is infectious. A reduction potential of 85 per cent is therefore achievable. Peace keeping forces are currently using public health care facilities and have not been taken into consideration in the above calculation.

#### Observations

- ✓ Hazard waste collection from the hospital is organised by the public waste service provider.
- ✗ Treatment options for hazardous waste treatment and disposal are not in place.
- ✗ Information about medium- and large-size hazardous waste generators was not available.
- ✗ A hazardous waste communication system is missing.
- ✗ Capacity for an intermediate controlled storage – in case of stoppages – is missing.

#### Sewage sludge

The existing waste water treatment facility in the south of the city – located in a conflict zone – is currently not functioning and is not considered for re-activation. There is no sludge management from sewage treatment activities and waste water is discharged directly into the river.

#### Industrial Waste

Available information suggests that only one commercial company is currently operating, but data from this cable-producing company was not available at the time this assessment was conducted. It is assumed, based on the size of operations, that an amount of around 7m<sup>3</sup> (1.5Mg) of waste is generated.

Mining waste and abandoned mining areas in the northern part of South Ossetia have not been taken into consideration in this assessment.

### **Debris/rubble from reconstruction activities**

No comprehensive reconstruction activities are in place due to the ongoing conflict. Illegal tipping in the suburbs and close to the river are, however, ongoing. Four main locations for such dumping have been investigated and mapped during this review.

### **Indirect waste**

Residential areas in and around the city of Tskhinvali have been impacted from the conflict. Some buildings are now completely abandoned, while others can be rehabilitated. A broad estimate suggests that more than 33 per cent of the volume and 40 per cent of the weight of building materials is recyclable or re-usable. Therefore a recycling and re-use strategy needs to be developed. Due to the recycling of concrete to aggregates an amount of 1,080Mg of re-inforcement metal can also be expected. Most of the bricks are unlikely to be re-usable.

Some advantages of a recycling and re-use strategy include (see main technical report for full details):

- diverting demolition waste from the landfill – a reduction of more than 30 per cent of materials;
- substituting raw materials;
- future recycling options;
- cost recovery from demolition waste and metal segregation: 1,080Mg of metal @ US\$150 = US\$162,000; 25,000Mg of aggregate @ US\$21 = US\$525,000; and 5,000Mg of infill material for remediation of dumpsites @ US\$7 = US\$35,000.

Such income could be used to purchase recycling equipment, could assist with environmentally sound construction of new settlements and remediation of the current site, remediation of open disposal sites and the creation of future employment strategies such as involvement of the informal sector.

Required equipment includes a front loader, backhoe loader, crusher, a screening station and metal separator and an excavator.

## **2.2 Waste Management Systems**

Waste collection is organised into three systems, namely:

- collection with compaction trucks and waste bins;
- door-to-door collection; and
- a skip system.

Tskhinvali City Administration is responsible for waste management in the urban and suburb areas, while the Regional Authority is mainly responsible for rural areas.

Much of the equipment related to all three systems noted above is in a state of disrepair. Forty per cent of the equipment at the truck yard of the municipal waste service provider, for example, is no longer functioning.

### **2.2.1 Waste transport**

Waste is collected and transported to the disposal area, located to the west of Tskhinvali. Access roads are in poor condition and access to the disposal site is not possible during wet weather. The access road requires rehabilitation.

### 2.2.2 Temporary storage of waste

Temporary storage sites have not yet been established. However, it is considered appropriate to identify such sites, particularly in those areas that may become inaccessible due to conflict, especially in the south of Tskhinvali (Zars industrial zone).

To avoid waste stockpiles from developing, temporary storage in 7m<sup>3</sup> containers might be considered in critical zones such as zone 5.

### 2.2.3 Waste reduction measures

Waste minimisation measures have not been established by the municipal waste service provider, although some such measures do exist at the household level. One of the most visible signs of the lack of recycling is the number of wrecked cars that have accumulated in peripheral areas of the city. Inaccessible roads have also discouraged scrap metal collection.

#### Observations

- ✓ Waste collection and transport responsibility is clearly defined.
- ✓ Re-use of some recyclable materials (bottles, paper...) is practised at household levels.
- ✗ The condition of the main roads is not conducive to regular waste collection and disposal.
- ✗ Truck fleet (>40 per cent) is not well maintained.
- ✗ Lack of temporary storage areas in case of no-access zones due to conflict.
- ✗ Overall waste reduction initiatives are absent.
- ✗ Accessibility of the dumpsite is not always possible due to bad conditions.

### 2.2.4 Waste disposal

The public service provider operates the dumpsite west of the city: the site has been in use since 1990, prior to which another site (now within the conflict zone) was used. Three other villages use this same facility.

With a 3km access road, the site is difficult to access during wet weather conditions. It is located on a slope (gradient 1:3) and at an altitude of 1,042m. No permanent equipment, guards or security facilities such as fencing have been established.

The site has an approximate area of 14,600km<sup>2</sup> and a total volume of 48.000m<sup>3</sup> of waste has been disposed thus far. Assuming settling with a bulk density of 450kg/m<sup>3</sup> and a daily amount of 110m<sup>3</sup> loose material, the site has a remaining lifetime of a maximum of 11 years.

### 2.2.5 Methane emissions

A clean development mechanism might be the potential for methane gas production at the dumpsite, but this is currently released unhindered into the atmosphere. Based on figures available since 1989, and with an annual estimation of 2 per cent increase per annum, some 18Mg of waste is generated in Tskhinvall each day.

With only 48,000m<sup>3</sup> of waste currently at the site, the gas production/collection potential is less than 30 per cent of the calculated one, which results in an emission of 0.96l/hour/m<sup>2</sup>, below the critical level of 1.2 l/hour/m<sup>2</sup>. A cover with low permeable material would likely be more than sufficient to collect the gas.

### 3. RECOMMENDATIONS AND FINANCIAL REQUIREMENTS

#### Observations

- ✓ Waste disposal location clearly identified.
- ✓ Other local authorities are sharing the same site.
- ✓ Site is to the north of the city in the main wind direction.
- ✓ Low rate on surface diffusion of methane (<1.2l/m<sup>2</sup>/h).
- ✗ Condition of access roads does not allow permanent access.
- ✗ No site security and safety.
- ✗ Recording and monitoring does not take place.
- ✗ No minimum operation standard is followed.
- ✗ Surface water management is missing and generates leachate.
- ✗ Equipment is missing.
- ✗ Re-use of generated methane gas is not economically feasible.

The conflict in the southern Caucasus has contributed to environmental degradation in the region. Improper waste management is further hampering the situation and is considered a key concern. Following this assessment and consultations, the technical mission concluded that immediate assistance is needed in South Ossetia to ease the health and environment risks related to waste management.

Immediate clean-up measures are not only needed but they are requested actions by the regional authorities. Furthermore, the findings of the mission highlight the opportunities that waste management initiatives might have for broader regional co-operation, the possibilities to generate revenue and to strengthen the institutional capacity and rule of law – all critically needed elements of redevelopment and steps towards peace building and recovering societies.

In developing these recommendations, the mission has considered the particular situation and needs in the region, the capacities of the parties as well as potential technically tailored solutions suitable to the region. In addition, given the potential momentum for targeted initiatives that ease the humanitarian situation and advance the overall recovery agenda, the recommendations have been developed in such a manner that would enable a quick launch of actions.

The proposed actions to address both recommendations could therefore be addressed in a modular manner, allowing one or more items to be implemented at a given time, depending on resources and political circumstances. All actions should, however, include training and capacity development measures to ensure sustainability of the solutions.

In order to seize the momentum for action, the mission further recommends a preparatory phase which would ensure appropriate consultations with regional authorities on the technical aspects of proposed actions. This phase should also aim to ensure maximum engagement of the appropriate parties, and begin to design the operational modalities and linkages to other relevant programmes in the region.

#### RECOMMENDATION I: IMPROVED AWARENESS RAISING AND REGIONAL COLLABORATION

There is a clear and urgent need for greater awareness of waste-related management issues in terms of peoples' health and welfare. This can only be effective in the long-term if regional co-operation is assured, noting that addressing the waste issue from this perspective can have many potential positive impacts that should contribute to greater peace in the region.

Currently waste is a nuisance and a health and safety issue, but this could be turned around to be a positive peace building engagement, as well as a livelihood support mechanism for members of the affected communities. Certain of the activities listed below address this need, but there is in addition a clear requirement in terms of institutional capacity building in all aspects relating to waste management issues.

## **RECOMMENDATION II: MITIGATE IMMEDIATE RISKS ASSOCIATED WITH WASTE**

This overarching need has four inter-related sub-components:

The current demographic situation can be assumed to have limited growth. A periodic increase of waste generation of around 2 per cent per annum is in accordance with international standards and reflects an increasing GDP. Unless current circumstances change dramatically, the amount of waste generated from Tskhinvali can be expected to increase from the current 6,825Mg per year to 8,000Mg within the next 10 years and up 10,000Mg within the next 20 years.

This site assessment identified 4,100m<sup>3</sup> of construction waste, mixed with scrap metal and with hazardous waste. Special emphasis needs to be given to developing hazardous waste management that consists of packaging, labelling and recording, using a central database. This system should reflect international standards and the requirements of the Basel Convention.

The following activities are recommended:

- Purchase new waste collection and storage equipment – vehicles and containers particularly.
- Engage additional service staff, particularly a mechanic, with appropriate training provided.
- Establishment of a waste information system, including improved awareness raising and information dissemination on waste management and waste recycling and collection systems.
- Stepwise extension of waste collection services in co-operation with responsible regional authorities in rural and semi-urban areas. This would include the removal of a large number of abandoned, scrapped vehicles.

### ***B. Waste Processing Facility/ Waste Reduction***

Waste reduction is often seen as a way to reduce and even minimise means impacts on the environment – through segmentation and recycling, for example – but it can also have significant and positive social and economic impacts through income generating activities. Two approaches are suggested:

- Waste reduction through simplified segregation of organic materials.
- Recycling paper, cardboard, tetra packs; metal, glass and plastics.

Linked with both activities is a need for manpower, equipment and maintenance budgets, as well as training. Furthermore, an appropriate site for the waste processing plant has been identified. This facility will be able to sort recyclable materials and prepare these for sale in the market. The facility itself will be a source of employment and a source of revenue which can be used to offset the costs related to waste collection and disposal.

### ***C. Hazardous and Hospital Waste Treatment***

There are currently no facilities in South Ossetia for the safe disposal of hazardous waste. Future waste management activities must address this gap, which is a major source of pollution for water bodies and soils. Currently, some 415kg of hospital waste is produced per day, so incineration is not considered economically feasible. Cheap “aid” systems are not recommended due to difficult handling and operations, and an increased production of dioxins and furans, caused by low temperatures. Further planning will help identify technically appropriate and financially affordable systems. Three activities are proposed:

- Segmentation and storage of selected hazardous waste: waste engine oil, lead batteries and wet cells, and household batteries. All three components have market relevance.

- A medical waste handling system should be planned for the hospital in Tskhinvali during rehabilitation, recognising international standards. This would include storage facilities for temporary segregation, collection, transportation and disposal of hospital waste.
- Staff training in terms of waste handling.

#### *D. Landfill Site Remediation*

The current landfill is located approximately 2km east of the city and is accessed by about 2km of paved road and 3km of unpaved road. It is recommended to remediate the site and to continue using it, until a new site is identified and established. Site remediation should start with repair of the access road, water management, improved drainage, the erection of safety fencing, and some degree of environmental rehabilitation with a view to slope stabilisation.

Two main activities are proposed:

- upgrading the existing road infrastructure to ensure accessibility; and
- site remediation.

According to initial assessments, an amount of approximately € 220,000 is required for the preparatory phase, and estimated requirement for the actual implementation phase is € 1,860,000. Broad details of these needs are available on request.