



**Your Trusted Partner In  
Environmental Management**



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# Trienekens

*Your trusted partner in environmental management*

The steady increase in volume and complexities of waste generated in Malaysia's largest State, Sarawak – as a result of rapid economic growth, urbanisation and industrialisation – had made it essential to have an effective and sustainable waste management system in place. In view of this, the Sarawak State Government signed a Joint Venture Agreement with international waste management expert Trienekens GmbH of Germany in November 1998, leading to the formation of concession holder Sarawak Wastes Management Sdn Bhd (SWM). SWM later appointed Trienekens (Sarawak) Sdn Bhd as the operator to develop, implement and operate Sarawak's **Integrated Waste Management System (IWMS)**, so transforming waste management in Sarawak to what it is today.

Drawing strength from more than 90 years of experience in the field of waste and environmental management, the Trienekens Group, with its reputable engineering companies coupled with exchange of technical know-how and project experience gained throughout Europe and Asia; offers municipal, commercial and industrial customers – including scheduled and hazardous waste generators; waste management solutions of the highest quality.

Trienekens strives to continuously improve the standards of environmental management

in parallel with the emergence of newer waste management technologies for both ecological and public health benefits, whilst placing equal importance on early education and public awareness as part of its efforts to instil a deeper sense of appreciation for the environment through green practices.

**The key operating principle of the IWMS as a whole is the elimination of negative effects arising from waste – particularly toxic waste, to both the environment and society; while preserving natural resources and rendering services of the highest standards to users. Trienekens is a service company advocating environmental protection and education, and believes that the responsibility for environmental management begins at the point of waste generation, be it a domestic dwelling or a multinational organisation.**

Unique as one-of-its-kind in the region, the successful integration of collection, transportation, treatment and disposal of municipal and hazardous waste by Trienekens has made the IWMS in Sarawak a reality, while the establishment of an efficient logistics system up to the final, secure disposal of all types of waste has firmly set Trienekens as South East Asia's leading company in the business of environmental and waste management.



# Comprehensive Solutions

*Sustainable logistics for a safer environment*

Logistics can best be defined as the management of business operations along the supply chain – such as the acquisition, storage, transportation and delivery of goods. Trienekens' sound and effective **Individual Logistics System** is a key component of the Integrated Waste Management System (IWMS).

In managing the essentials of logistics planning, Trienekens' flexible, tailor-made logistics concepts complemented by its fleet of collection vehicles and receptacles make it possible for the company to address different logistical requirements. While fixed and reliable collection schedules and appropriate transportation arrangements are integral to the plan, what beats in the heart of each logistics concept is a centralised communications system which facilitates fast and efficient interaction between the logistics depot, hotline centre, all vehicles, hazardous waste operations and landfills.

Trienekens covers the service scope of municipal waste services for a majority of the population in the State's capital city Kuching, besides also providing collection, treatment and disposal services for scheduled and hazardous waste throughout Sarawak, Sabah and the Federal Territory of Labuan.

The adoption of a German logistics model requires that some of the major vehicle components be imported from Europe, in line with the company's focus on quality and resilience of machineries – while safety features with ergonomic considerations of the workforce also plays an important role in vehicle maintenance. Trienekens' ongoing upgrading of vehicles moving towards a full fleet of European emission standard vehicles aims to one day ascertain a truly sustainable logistics system, where minimisation of carbon emissions and increased fuel efficiency will increase public health benefits and preserve the environment from further degradation.



### **Municipal Household Waste Services**

Trienekens provides collection and transportation services for residential and commercial waste for Local Authorities and customers.

Domestic dwellings within the jurisdiction of Kuching North City Hall (DBKU), Kuching South City Council (MBKS), Padawan Municipal Council (MPP) and certain areas under the Serian District Council (MDS) are provided with 120-litre mobile garbage bins which are emptied twice a week. Additional waste of reasonable volume, which are properly packed in sealed garbage bags and placed beside the bin will also be collected. The usage of wheel bins under these council jurisdictions is compulsory.

### **Collection Schedule**

Trienekens collects twice a week from households and commercial entities with basic entitlements.

Residents are advised to place their bins outside their homes on or before collection day to ensure that the bins are emptied. Bins placed inside the compound of a premise, or in an inaccessible location, will not be emptied.



### Municipal Commercial Waste Services

Mobile Garbage Bins ranging from 120 to 1100 litres are available while different collection frequencies are offered to cater for the type of waste generated. Commercial entities that regularly generate high volumes of waste due to their operations can request for additional collection frequency or bin services under the Additional Collection Request (ACR) System from the appropriate Local Authority.

ACR fees are in accordance with the “Polluter Pays” principle, where polluting parties pay for the impact caused to the environment.

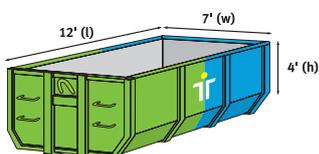
### Container Services For Bulky Waste

Roll-on/Roll-off (RoRo) containers are typically required for entities generating large amounts of waste including:

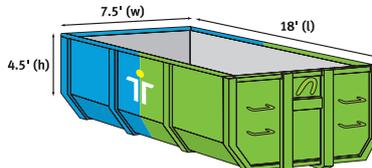
- Construction waste
- Garden/ green waste
- Renovation waste
- Bulky waste

Trienekens will assist the customer to identify the best service solution to cater for individual needs with RoRo containers of various sizes and specifications available.

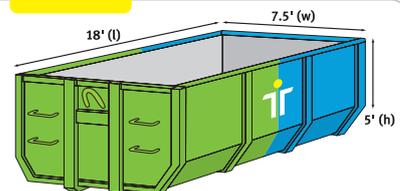
10 cbm



16 cbm



20 cbm





### **Scheduled & Hazardous Waste Services**

The management of scheduled and hazardous waste requires experience and diligence, as well as special resources and equipment not just because of the nature of such waste, but for compliance to legal frameworks regulating the handling of these waste.

Trienekens offers a comprehensive range of services for the handling, collection, transportation, treatment and final disposal of scheduled waste, including toxic, pathological and clinical waste; thus opening avenues for proper management of these strictly regulated industrial by-products for all waste generators.

With a diversified fleet of fully licensed collection vehicles, special equipment of

international standards and a team of trained experts, Trienekens presents itself as the first One-Stop-Agency for the management of scheduled waste in the region.

The flexibility for service customisation and complete available range of equipment and facilities addresses the different needs and requirements of all customers – from small workshops, SMIs, or specialised industries, to multinational companies.

All collected hazardous waste is disposed of at Trienekens' Kuching Integrated Waste Management Park, the most modern integrated waste disposal facility in South East Asia.

The range of scheduled waste services provided and benefits include:

- Integration of all waste management services resulting in higher levels of cost efficiency for all hazardous waste generators.
- Availability of various service packages to suit different needs enables customers to reorganise their scheduled waste handling in a more economical and fully compliant way.
- Deployment of modern equipment and availability of the state-of-the-art waste management park ensures compliance to all international environmental standards.
- Utilisation of a diversified fleet of licensed trucks and provision of regular collection of waste reduces costs and risks related to on-site storage of waste.
- Handling of necessary documentation pertaining to the collection, transportation and disposal of scheduled and hazardous waste in accordance with the prevailing regulatory requirements.



# Effective Environmental Engineering

## *The Kuching Integrated Waste Management Park (KIWMP)*

Waste management is an integral part of urban environmental planning and infrastructure development to ensure a safe and healthy human environment while considering sustainable economic growth. Trienekens' services and treatment facilities for municipal, commercial and scheduled waste – from logistics planning; landfill engineering, compaction and layering; to incineration of hazardous waste; interception of leachate and its treatment; control of methane release from waste decomposition and rehabilitation of closed landfills – takes into account all ecological impacts with respect to the pollution of soil, water and air.

A core element of the Integrated Waste Management System (IWMS) is the Kuching Integrated Waste Management Park (KIWMP), located some 27 kilometres from Kuching city. As the first Integrated Waste Management Park in South East Asia, the facility serves as the receiving end for collected waste.

The Park sits on 112 hectares of ideal geographical and geological landscape and has four main components namely; a sanitary landfill (for municipal waste), a secure landfill (for hazardous waste), a leachate wastewater treatment plant and a scheduled waste incineration facility for the thermal treatment and disposal of scheduled waste.



## Sanitary Landfill

In Malaysia's tropical region, decomposition begins much faster than in temperate Europe. Due to the mixture of diverse waste, chemical reactions can occur in landfills over extended periods of time. KIWMP's sanitary landfill was designed in such a way that gases and moisture can be drained off in a controlled manner. Here, landfill gases mainly consisting of methane and carbon is collected and maintained under a vacuum by an extensive underground pipeline system. The methane is subsequently flared off and can be used to provide thermal energy and electricity. Trienekens' responsibility for the environment continues even after operations of the landfill ceases. Once the last protective layer has been laid, re-cultivation of the entire expanse of the landfill begins. While vegetation beautifies, regular control of the drainage and degasification system ensures safe conditions of the former site. Additionally, groundwater is continuously tested, to ensure that barriers remain watertight.



## Secure Landfill

The secure landfill caters to the disposal of hazardous waste that are not suitable for incineration and ash from the scheduled waste incineration facility. A double-liner system ensures maximum safety while the landfill itself sits on solid rock as a geological barrier. Stringent operating procedures and covering of the waste with impermeable material ensures that the landfill does not have any adverse impacts on the environment or on the people working at the facility. Leachate wastewater from the secure landfill is pre-treated in a chemical treatment stage where heavy metals are removed, before undergoing the same extensive treatment as the wastewater from the sanitary landfill.

- Multi-layered base sealing and drainage system comprising of clay barrier, sealing layer, textured HDPE lining, non-woven fabric and drainage layer.
- Leachate collection and treatment system as well as surface water percolation collection ponds. Leachate is treated to meet the most stringent environmental standards.
- Use of specialist machinery and equipment.



### Leachate Wastewater Treatment Plant

Leachate is produced when biodegradable waste is exposed to the anaerobic conditions of a landfill body, further broken down by bacteria, which finally produces gas and soluble compounds. The soluble compounds combined with rainwater or other liquid forms leachate – a composition of water, organic and inorganic substances from the putrefaction of waste. While bacteria will degrade the waste; this can take up to hundreds of years. As leachate is a potential hazardous waste that can cause contamination and health problems, it is critical that leachate be properly contained and treated.

Leachate wastewater from the sanitary and secure landfill is collected through an extensive network of underground pipes and pumped to the leachate wastewater treatment plant. All leachate is treated in a multi-stage process including biological and chemical treatments, clarifiers and activated carbon reactors as the final polishing stage to ensure the highest treatment results. Fully automated and continuously monitored via Programmable Logic Controllers (PLC), the facility has a treatment capacity of 1000m<sup>3</sup> a day and utilises the latest technology and equipment to further remove nutrient contaminants present in leachate wastewater.

Beside quarterly surface water and groundwater monitoring by a professional third party body, discharged effluent is also sampled and tested daily to ensure it meets regulatory requirements.



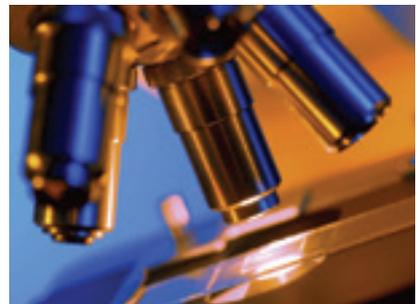


## Laboratory

Trienekens' full-service laboratory is capable of analysing a wide range of wastewater parameters. Certified with ISO/IEC 17025, the laboratory was set up intent on moderating all treatment processes and effluent quality at the Kuching Integrated Waste Management Park. Wastewater samples are collected daily from various sampling points and analysed to check their compliance with various regulations and standards.

Certified personnel with full instrumentation capabilities provide quality analytical data according to methods set forth in EPA (Environment Protection Agency) methods for Water and Wastewater, APHA (American Public Health Association) Standard Methods for the Examination of Water and Wastewater, ASTM (American Society for Testing and Materials) analytical methods as well as DIN (German Institute for Standardisation) methods. In addition, the laboratory's wide range of equipment from simple bench-top pH meters to complex spectrometers such as the Atomic Absorption Spectrometer (AAS) ensures that the laboratory is fully equipped to carry out all tests related to water and wastewater.

Apart from internal monitoring, compliance monitoring is also regularly administered by appointed certified third party laboratories.



## Scheduled Waste Incineration Facility

The scheduled waste incineration facility for the disposal and treatment of hazardous waste consists of two fully computerised Incineration Plants. Both plants are equipped with a continuous emissions monitoring system, and are capable of treating hazardous waste including toxic, industrial, clinical and pathological waste.

The facility's incineration treatment not only incinerates hazardous waste but also controls emissions to a point that the treatment is considered to be environmentally beneficial, as opposed to alternative methods of hazardous waste disposal. Just like in common incineration, burning occurs, however the Plants' cutting edge technology allows for digital control of the amount of oxygen allowed in each chamber, hence controlling the combustion rate of waste – resulting in a significant reduction of any harmful bi-products and air pollutants.

- Combined disposal capacity of up to 30,000 tonnes of mixed scheduled waste per annum.
- Waste destruction at temperatures of up to 1200 degrees Celsius.
- Continuous emissions monitoring system.
- Full computerisation of all components.
- Complies with international health, safety and environmental standards.



## Central Storage Facility

Trienekens' interim storage facilities are constantly upgraded based on the latest tonnage data, to facilitate better waste reception and to comply with prevailing storage capacity requirements.

- Containment bunds or kerbs as a safety and control measure against spillage.
- Ambient air exchange and control.
- Alarm, monitoring and control systems.
- Epoxy painted flooring to prevent chemical permeation.





# Rehabilitation Of Disposal Sites

Once a landfill reaches its designed height or is no longer in operations, it is re-cultivated, section by section, according to the filling sections. Upon closure of a site, Trienekens will carry out an extensive surface rehabilitation programme to ensure that any environmental impacts are significantly reduced.

The rehabilitation programme minimises post-closure leachate generation arising from percolation of rainfall, converting the percolation into surface runoff without eroding the landfill cover. The closure method also prevents uncontrolled penetration of precipitation water into the landfill structure; and further prevents emission of landfill gas from the former disposal site.

Management, monitoring, decontamination, re-cultivation and aftercare of such disposal sites are part of the many environmental management services offered by Trienekens to its municipal partners.



# Synergistic Effects And Advantages Of The Integrated Waste Management System

By integrating the collection, transportation, treatment and disposal of municipal, commercial and hazardous waste, the first real One-Stop-Agency for waste management has been successfully realised, resulting in the following benefits:

- Sufficient volume of waste allows for the adoption and use of modern technologies to handle waste according to the latest environmental standards and prevailing regulatory requirements.
- Provision of cost effective services for customers is made possible through centralised operations with synergistic effects arising from the integration of all components.
- Availability of customised waste management solutions for all waste generators.
- Minimisation of environmental impacts and maximisation of land use through integration with sustainable development.
- The liability rests with only one operator.
- Full compliance to the Basel Convention.

The Integrated Waste Management System is a holistic, environmentally sound system for the benefit of Sarawak, the country of Malaysia and its South East Asian neighbours.



# In Touch With The Community



The public is the most important stakeholder in ensuring the successful implementation of an exemplary waste management system. The company believes that with the people's support and universal vision for a higher quality of life through the creation of a safe and environmentally sound waste management system, it can contribute towards the country's vision of becoming an industrialised nation by the year 2020.

Trienekens strives for conservation of the earth's natural resources, protection of the environment and provision of quality services.





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