مـــوان MWAN
المركز الوطني لإدارة النفايات
National Center for Waste Management

# الضوابط والأدلة الفنية
# لفصل النفايات الصناعية من المصدر

# Standards & Technical Guidelines
# Sorting at Source – Industrial Waste

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# TABLE OF CONTENTS

TABLE INDEX ..... 9
FIGURE INDEX ..... 9
ABBREVIATIONS ..... 4
DEFINITIONS ..... 5
1 PURPOSE & SCOPE ..... 10
1.1 Why does KSA need effective Sorting at Source of Industrial Waste ..... 10
1.2 Contribution to National Waste Management Strategy (NWMS) ..... 10
1.3 Scope and Audience ..... 11
2 REGULATORY FRAMEWORK AND LEGAL REQUIREMENT ..... 13
2.1 Key National Regulations and Programs ..... 13
2.2 Key International Agreements, Standards, and Regulations ..... 14
3 SORTING SYSTEM – TECHNICAL DESIGN ..... 16
3.1 Sorting at Source Specification for IW ..... 18
3.1.1 Waste Audit, Identification, and Characterisation ..... 18
3.1.2 Internal Routing for IW ..... 19
3.1.3 Non-Hazardous IW ..... 20
3.1.4 Hazardous IW ..... 20
3.1.5 Licensed Treatment Facility (LTF) ..... 21
3.1.6 Level of segregation ..... 21
3.1.7 Containers ..... 21
3.1.8 Temporary Storage for IW ..... 24
3.2 Health and Safety Considerations for IW Sorting at Source ..... 26
3.2.1 Risk Assessment and Hazard Identification ..... 26
3.2.2 Use of Personal Protective Equipment (PPE) ..... 26
3.2.3 Safe Handling and Storage Practices ..... 26
3.2.4 Ventilation and Air Quality Management ..... 26
3.2.5 Emergency Preparedness and Response ..... 27
3.2.6 Training and Competency Development ..... 27
3.2.7 Monitoring and Continuous Improvement ..... 27
4 GOVERNANCE MODEL – ROLES AND RESPONSIBILITIES ..... 28
4.1 Key Stakeholders ..... 28
4.2 Roles and Responsibilities ..... 29
5 ENFORCEMENT AND COMPLIANCE ..... 31
5.1 Role of Key Authorities ..... 31
5.1.1 Ministry of Industry and Mineral Resources (MIM) and Ministry of Municipalities and Housing (MoMAH) 31
5.1.2 National Center for Waste Management (MWAN) ..... 31
5.2 Enforcement Measures ..... 31
5.2.1 Monitoring and Inspection ..... 31
5.2.2 Inspection Focus Areas ..... 31

FINAL DRAFT

5.2.3 Coordination of Inspections ..... 31
5.2.4 Reporting and Data Management ..... 32
5.3 Compliance Mechanisms ..... 34

FINAL_DRAFT

## ABBREVIATIONS

| | |
|---|---|
| ADR | European Agreement concerning the International Carriage of Dangerous Goods by Road |
| CDW | Construction and Demolition Waste |
| HDPE | High-Density Polyethylene |
| HW | Healthcare Waste |
| IATA | International Air Transport Association |
| IBC | Intermediate Bulk Container |
| IMDG | International Maritime Dangerous Goods |
| IR | Implementing Regulations |
| ISIC | International Standard Industrial Classification |
| ISO | International Organization for Standardization |
| IW | Industrial Waste |
| KSA | Kingdom of Saudi Arabia |
| LTF | Licensed Treatment Facility |
| MEWA | Ministry of Environment, Water and Agriculture |
| MFSU | Manufacture, Formulation, Supply, and Use |
| MIM | Ministry of Industry and Mineral Resources |
| MODON | Saudi Authority for Industrial Cities and Technology Zones |
| MoMAH | Ministry of Municipal, Rural Affairs, and Housing |
| MSDS | Material Safety Data Sheet |
| MSFU | Manufacture, Formulation, Supply, and Use |
| MSW | Municipal Solid Waste |
| MWAN | National Center for Waste Management |
| NCEC | National Center for Environmental Compliance |
| NWMS | National Waste Management Strategy |
| PPE | Personal Protective Equipment |
| RCRA | Resource Conservation and Recovery Act |
| RCJY | Royal Commission for Jubail and Yanbu |
| SW | Special Waste |
| TG | Technical Guideline |
| TGA | Transport General Authority |
| UN | United Nations |
| WM | Waste Management |
| WML | Waste Management Law |

## DEFINITIONS

| | |
|---|---|
| Authorised Person | The person who has obtained the permit from MWAN. |
| Centralised Collection Point | A central location where Waste can be temporarily stored before being transported for processing, treatment, or final disposal. |
| Circular Economy | An economic model that aims at sustaining products and consumable sources for the longest period possible by way of consuming products to each product's maximum limit if it is usable, and to turn it recyclable and regeneratable thereafter upon the end of its lifecycle. |
| Collection | The collection of Waste from containers designated for storage of various sizes and types by using trucks and machinery designated for this purpose. |
| Competent Authorities | The government entity responsible for operationally managing Waste in accordance with a special regulatory provision. |
| Construction and Demolition Waste | All solid Waste arising from construction and demolition activities. This includes Waste produced from construction of buildings and infrastructure, destruction or demolition of buildings and infrastructure, and the maintenance, renovation, rehabilitation and refurbishment of buildings and infrastructure. Construction and demolition Waste includes without limitation brick, concrete, hardcore, subsoil and topsoil, materials resulting from excavation works, and it can also include quantities of timber, metal, plastics and, occasionally, hazardous materials |
| Container | A vessel or receptacle designed to hold, store, or transport Waste materials securely, preventing leaks, spills, and contamination. |
| Container Specification | Refers to the detailed criteria that define the design, size, material, labelling, and functionality of Special Waste containers. These specifications ensure Containers are suitable for different Waste types and environments, covering aspects like capacity, material, user accessibility, safety features, maintenance requirements, and other considerations. |
| Contamination | The presence of non-recyclable or unsuitable materials in a recycling bin or stream. This disrupts the recycling process, lowers the quality of recyclable outputs, and raises processing costs. Contamination typically results from improper waste sorting. |
| Dangerous Goods | Dangerous goods are all substances and articles that pose a risk to human health and the environment during Transportation. |
| Designated Storage Area | A specific location allocated to the temporary storage of Waste before they are processed, treated, or disposed of. |
| Environmental Impact | Every negative or positive change that affects the environment due to the practice of any activity. |
| Environmental Pollution | The existence of one or more substances or factors in certain quantities or qualities for a period that directly or indirectly harm the environment. |
| Hazardous Waste | Waste classified as hazardous based upon the provisions of the Law and Regulations, which is resulting from industrial or non-industrial activities that contain toxic, flammable, or reactive materials, or corrosives, solvents, degreasers, oils, colorants, paste residuals, acids, and alkalis |
| Healthcare Waste | Waste that is produced from facilities that provide various health care services, laboratories, drug production centers, pharmaceuticals and vaccines, veterinary treatment centers and research institutions, and from treatment and nursing in the home |

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| Health and Safety | Refers to the practices, laws and regulations designed to protect individuals from accidents, injuries and illness in the workplace and the public environment. It involves identifying, assessing, and controlling hazardous and the risks to the environment and individuals. |
| Industrial Waste | Any Waste that is generated from industrial operations or derived from manufacturing processes (including but not limited to mining Waste); may be solid, sludge (wet solids) or liquid Wastes and may or may not be considered Hazardous as per definition of Hazardous Waste. |
| Landfill | An engineered Waste disposal site, comprising all established and recognized engineered control methods to protect the environment (air, water, groundwater, soil, ecological settings, etc.) for the deposit of the Waste onto or into land (i.e., underground). |
| Landfill diversion rate | Share of total Waste produced (by weight) diverted from disposal of in Landfills to total Waste produced (by weight). |
| Law | Waste Management Law. |
| License | A written permission issued by the MWAN for the purpose of carrying out any activity related to Waste management in accordance with the controls determined by the Law and IRs. |
| Licensed Treatment Facility | A facility that is licenced or permitted by MWAN for the treatment, processing, storage, and disposal of Waste. |
| Material Safety Data Sheet (MSDS) | A document that provided detail information about the properties, handling, storage, and disposal of a chemical substance. It includes essential data such as the chemical's hazards, potential health effects, first aid measures, safe handling practices, and emergency response protocols. The MSDS is designed to ensure safe usage of chemicals and is required by regulatory bodies to inform workers and emergency personnel about the risks associated with handling hazardous substances. |
| Municipal Solid Waste | Includes Residential Waste, which is Waste resulting from the usual activity of households, whether they are collected mixed or separately, and includes Commercial and Administrative Waste, which is Waste that is produced from other sources that are similar in nature and composition to Residential Waste. |
| National Waste Management Strategy (NWMS) | Comprehensive national plan that outlines the vision, ambitions, strategic objectives, and measurable targets to improve the performance of the Waste management sector in KSA. It identifies current gaps, sets directions and actions for sector transformation, establishes a timeline for progress monitoring, and outlines the sector's contribution to the national economy. |
| Non-Hazardous Waste | Waste that does not impose any risks to the general health or environment, and that may not be classified as Hazardous Waste. |
| Permit | A document granted by MWAN to Waste recycling establishments stating that they have fulfilled MWAN's controls and requirements, before obtaining the licenses issued by the competent authorities in accordance with their regulations. |
| Producer Groups | Categories of Waste Producers. |
| Production | The process by which materials are discarded as Waste. This can occur in various settings, including residential, commercial, and industrial activities. |
| Raw Materials | Natural resources used as inputs in production processes, such as metals, plastics, and minerals, that can be recovered and reused through Recycling. |

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|---|---|
| Recyclable Materials | Materials that can be processed and transformed into new products, reducing the need for virgin resources and minimising environmental impact. |
| Recycling | The process of converting certain components of Waste into usable materials for recovery or use as raw materials in manufacturing processes. |
| Resource Recovery | The process of extracting energy, raw materials, or any other product from Waste and using it again. |
| Re-use of Products | Reusing materials and resources as much as possible before turning them into Waste. |
| Safe Disposal | Safe storage or disassembly of any type of Waste in an engineering manner that prevents causing any pollution or negative impact on the environment, including soil, air, water, and biological diversity. These methods include engineered landfills, prepared incinerators, and other licensed technologies and facilities, which contain the technical technology necessary to protect public health, safety, and the environment. |
| Service Provider | The person licensed or authorized to engage in one of the Waste Management activities. |
| Sorting | Separating Waste components from each other manually or automatically, such as paper, glass, metals, and other components in transition stations or sorting and treatment facilities, with the intention of Recycling or treating them. |
| Sorting at Source | Defined as Segregation at Source under IRs of WML – The action of the generator of the Waste of segregating their Waste to its components as defined by the nature of such Waste, to enable higher resource recovery through recycling or reuse. |
| Special Waste | Waste classified as SW in accordance with the technical controls that MWAN will issue in this regard. For the purposes of this TG, Special Waste consist of: Electrical and Electronic Waste, Batteries and Accumulators (EEWBA), End of Life Vehicles (ELVs) and End of Life Tires (ELTs). |
| Stakeholder | Any individual, group, or authority with an interest in or affected by Waste Management activities, including Producers, Service Providers, regulators, and the public. |
| Storage | Temporarily storing all or part of the components of Waste for transportation or future use. |
| Transfer Stations | Facilities that are used at a stage in the process of transferring Waste collected to Waste treatment or sorting sites and facilities or to safe disposal sites. |
| Transport Document (Manifest) | The form specified by the competent entity to follow up on the Waste from the point of production to the point of safe storage, handling, or disposal. |
| Transportation | Transporting Waste by approved means of transportation to transfer stations, treatment or sorting facilities, or approved Landfills. |
| Treatment | It means the use of physical, biological or chemical means, or a combination of these means, or others to bring about a change in the specifications of Waste in order to reduce its volume, or facilitate the processes of treating it when reusing or recycling, or extracting some products from it or to remove organic pollutants and others in order to reduce or utilize some of the Waste components or eliminate the possibility of harm to humans or the environment. |
| Waste | All materials that are discarded or disposed of, and that directly or indirectly affect public health or the environment. |

| | |
|---|---|
| Waste Management | Organising any activity or practice related to Waste commencing from Waste collection, transportation, sorting, storage, treatment, recycling, import, export, and safe disposal, including aftercare at Waste disposal sites. |
| Waste Producer | Every person who produces classified Waste according to the provisions of the Law. |

FINAL_DRAFT

# TABLE INDEX

Table 1 KPIs Related to IW Within the NWMS ..... 10
Table 2 Key Stakeholders Target Audience ..... 11
Table 3 Primary IW Producers ..... 12
Table 4 Industrial Waste Sources and Types ..... 16
Table 5: Standards and guidelines for smooth and compliant IW transfer within a facility that produces IW ..... 19
Table 6 Skips and Roll-on/Roll-off Container Sizes for Non-Hazardous IW Sorting at Source ..... 22
Table 7 Containers Suitable for the Sorting at Source of Hazardous IW ..... 22
Table 8 Storage compatibility for different hazardous properties ..... 25
Table 9 Governance Model - Roles and Responsibilities (RACI Matrix) ..... 29
Table 10 RACI Matrix for Monitoring and Inspection ..... 32

# FIGURE INDEX

Figure 1 Sample of a Hazardous Waste Label ..... 24

FINAL_DRAFT

# 1 PURPOSE & SCOPE

## 1.1 Why does KSA need effective Sorting at Source of Industrial Waste

Industrial Waste (IW) is one of the largest contributors to Waste in the Kingdom of Saudi Arabia (KSA). These Technical Standards and Guidelines (TGs) address the Sorting at Source of all IW produced from industrial processes across KSA. Sorting at Source involves separating IW streams at the point of production.

IW streams are produced by a diverse range of industries and processes, resulting in IW that varies in composition, physical state, hazardous properties, and resource potential.

Due to the complex nature of IW, it must be categorised based on the classification and characterisation of the various material types in IW. All IW must be characterised and classified according to the MWAN Technical Guideline on Waste Classification.

KSA faces the challenge of balancing its economic diversification and industrial growth with the increasing production of IW. The need for effective and integrated Waste Management (WM) has become increasingly important. Implementing Sorting at Source of IW is an important step in addressing this issue, offering several environmental, economic, and sustainable advantages.

IW management faces several challenges due to its volume and diversity. Each material requires specific handling and management methods. The mixing of different types of IW can lead to adverse reactions and the generation of Hazardous substances. Proper classification and Sorting at Source of these materials is the first step in effective IW management, supporting the mitigation of environmental, health, and safety risks posed by these materials.

Although some IW contains Hazardous substances, many of these material streams contain valuable resources that can be recovered or recycled. By implementing Sorting at Source, KSA can enhance Recycling and Recovery rates, reduce dependency on raw materials, and increase Landfill diversion as the kingdom strives towards a Circular Economy.

## 1.2 Contribution to National Waste Management Strategy (NWMS)

The National Waste Management Strategy (NWMS) of KSA encompasses 11 strategic objectives aimed at enhancing Waste Management practices across the country. These TGs for the Sorting at Source of IW are aligned with these objectives and are vital in supporting the achievement of the Key Performance Indicators (KPIs) for the management of IW set by the NMWS. The KPIs related to IW are listed in Table 1.

*Table 1 KPIs Related to IW Within the NWMS*

| KPI | IW Targets | | |
|---|---|---|---|
| | 2030 | 2035 | 2040 |
| [X%] Reduction of IW generated per SAR m of GDP (Amount of Waste reduced per 1 million SAR of manufacturing GDP) | 9% | 16% | 25% |
| [X%] of source segregated IW | 57% | 81% | 95% |
| [X%] of IW landfill diversion rate | 18% | 40% | 89% |
| [X%] of IW prepared for recycling | 14% | 32% | 72% |
| [X%] of hazardous Waste treated or disposed of as per official guidelines | 90% | 95% | 100% |

By setting clear requirements for the Sorting at Source of IW, the NMWS and these TGs play a pivotal role in driving the implementation of effective Waste Management Systems that contribute to the KPIs in Table

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1, thereby enhancing sustainability and resource efficiency throughout KSA.

## 1.3 Scope and Audience

### 1.3.1 Target Audience

These TGs have been developed as standards and guidance for, but are not limited to, the Stakeholders listed in Table 2, which includes Public and Private Sector Entities, Waste Management Service Providers, Facility Operators, Manufacturers, and other parties involved in the production, Handling, Collection, and Treatment of IW. By following these TGs, Stakeholders can better align their IW management practices with national goals, the KPIs in Table 1 and contribute to the Circular Economy and support sustainable development in KSA.

Please note that these TGs are for IW only and do not address the management requirements for other Waste Streams.

*Table 2 Key Stakeholders Target Audience*

| Stakeholder | Applicability |
|---|---|
| **IW Producers** | These TGs provide guidance on effective management and Sorting at Source requirements for IW produced by various IW Producer groups. |
| **IW Management Service Providers and Contracted Entities** | These TGs are designed to support IW management service providers responsible for the collection, transportation, disposal, treatment, recycling, and recovery of IW. They must be referenced in IW management contracts and integrated into the overall management of IW. |
| **The National Center for Waste Management (MWAN)** | MWAN is responsible for overseeing, regulating, and implementing Sorting at Source practices throughout KSA. It also regulates the management of IW and monitors progress towards achieving the objectives of the NWMS. MWAN is responsible for issuing, monitoring, and implementing these TGs throughout the Kingdom. |
| **Competent Authorities** | These TGs provide the requirements and guidance for authorities with oversight responsibilities involved in the issuance of licences, permits, and regulations relating to the generators of IW and governmental entities responsible for operationally managing IW under their regulatory provisions. |

### 1.3.2 IW Streams Targeted by These TGs

This TGs define IW by using the MWAN Technical Guidelines on Waste Classification (Table 4). These TGs are applicable to all IW streams produced from Industrial Processes.

### 1.3.3 Waste Streams Not Targeted by These TGs

IW Producers (Table 3) will also produce other Waste streams such as Municipal Solid Waste (MSW) from offices, Construction and Demolition Waste (CDW) and Special Waste (SW). These Waste streams are not addressed by this TG. IW Producers must consult the relevant TGs for MSW, CDW, SW and other non-IW streams to understand and be guided on how to sort these Waste streams at source.

FINAL DRAFT

### 1.3.4 IW Producer groups

Table 3 is a non-exhaustive list of primary IW Producer groups for which these TGs are applicable.

*Table 3 Primary IW Producers*

| ISIC Code | Industry Description | Industrial Waste Producers |
|---|---|---|
| 3510 | Electric power generation, transmission, and distribution | Power stations, power plants, renewable energy generation |
| 1920 | Manufacture of refined petroleum products | Oil refineries, petroleum refining, pyrolytic treatment of coal |
| 0910 | Support activities for petroleum and natural gas extraction | Petroleum and natural gas production |
| 2391 | Manufacture of refractory products | Manufacture of bricks, ceramics, and glass |
| 2420 | Manufacture of basic precious and non-ferrous metals | Metallurgists, foundries, manufacturers of ferrous and non-ferrous metals |
| 2011 | Manufacture of basic chemicals | Inorganic chemical processing, organic chemical processing, manufacture of pharmaceuticals |
| 2023 | Manufacture of soap and detergents, cleaning and polishing preparations, perfumes, and toilet preparations | Chemical waste from manufacturers in this category |
| 7420 | Photographic activities | Photographers, manufacturers of photographic chemicals and films |
| 1010 | Processing and preserving of meat | Food producers |
| 1104 | Manufacture of soft drinks, mineral water, and other bottled water | Drink producers |
| 0899 | Other mining and quarrying | Mining operations, mineral extraction |
| 2399 | Manufacture of other non-metallic mineral products | Waste from mineral treatment and quarrying |
| 2022 | Manufacture of paints, varnishes, and similar coatings | Manufacturers of paints, coatings, varnishes, adhesives, and resins |
| 2220 | Manufacture of plastics products | Manufacturers of plastics |
| 1701 | Manufacture of pulp, paper, and paperboard | Processors of paper and cardboard |
| 1629 | Manufacture of other products of wood | Manufacturers of wood and wood preservatives |
| 2910 | Manufacture of motor vehicles | Automotive and vehicle manufacturers |
| 1729 | Manufacture of other articles of paper and paperboard | Packaging manufacturers |
| 2821 | Manufacture of agricultural and forestry machinery | Waste from manufacturing of parts and equipment |

FINAL DRAFT

# 2 REGULATORY FRAMEWORK AND LEGAL REQUIREMENT

The standards and guidelines provided in these TGs need to be used in conjunction with the existing regulatory based in KSA. These TGs complement and support the regulatory framework and legal requirements within the Kingdom. This chapter outlines the essential laws, regulations, and standards that entities relevant to IW management must adhere to when operating within KSA.

The Waste regulatory framework in KSA is based on the Waste Management Law (WML) and its Implementing Regulations (IRs), aligning with other local regulatory documents as well as international agreements, standards, and regulations to ensure comprehensive compliance and sustainability.

In addition to the WML and IRs, it is important to recognise that certain regulations are compulsory for specific entities operating within designated industrial zones. For instance, entities located within the industrial cities managed by the Saudi Authority for Industrial Cities and Technology Zones (MODON) or those under the purview of the Royal Commission for Jubail and Yanbu (RCJY) are required to comply with additional regulations specific to these areas. These targeted regulations are designed to ensure that Waste Management practices comply with national and international standards, while also addressing the specific needs of local industries. The adherence to these area-specific regulations is crucial for promoting accountability and enhanced environmental stewardship across the Kingdom's diverse industrial sectors.

## 2.1 Key National Regulations and Programs

The following laws and regulations form the legal basis for Waste Management in the KSA, including Sorting at Source for IW and it comprises of compulsory regulatory documents as follows:

- WML – Compulsory
- IRs – Compulsory
- Standards and Technical Guidelines by MWAN – Compulsory
- MODON Regulations of Industrial Cities – Compulsory for MODON’s partners
- RCJY Environmental Regulation – Compulsory within RCJY industrial cities

### 2.1.1 WML

The following Article in the WML impacts the Sorting at Source of all Waste:

- **Article 5:** This article outlines the priority order for Waste management practices: Recycling, Resource Recovery, and Safe Disposal. While it doesn't directly mention Sorting at Source, sorting is a critical first step in enabling recycling and resource recovery.
- **Article 11:** Waste Producers must sort reusable or recyclable Waste by placing it in designated locations after the Waste is generated. The types of Waste that need to be sorted are determined by the regulations.

### 2.1.2 IRs of WML

The following Article in the IRs impact the Sorting at Source of Waste:

- **Article 65 - Requirement for Segregation:** Waste Producers are required to follow the controls and guidelines issued by MWAN concerning the segregation of Waste at its source.
- **Article 66 - Segregation of Reusable or Recyclable Waste:** Waste must be segregated at the source into categories that can be reused or recycled. This must be done by placing the Waste in designated containers, following health and safety regulations as well as guidelines from MWAN.
- **Article 67 - Maintenance of Segregation During Management:** Service Providers responsible for Waste collection, transport, storage, and treatment must ensure that Waste remains segregated throughout all stages of the management process, adhering to MWAN’s technical guidelines.

FINAL DRAFT

- **Article 68 - Segregation of Hazardous and Non-Hazardous Waste:** Waste Producers must ensure the separation of hazardous Waste from non-hazardous Waste at the source. Proper identification of the different Waste streams is mandatory, in accordance MWAN's guidelines.
- **Article 69 - Prohibition of Mixing Hazardous Waste:** It is strictly prohibited to mix different streams of hazardous Waste with each other.
- **Article 70 - Mixing in Special Circumstances:** In cases where separating different hazardous Waste streams is not possible, the Waste Producer must take steps to prevent adverse reactions, ensuring that the mixed Waste does not pose a danger to human health or the environment and does not complicate the treatment process.

### 2.1.3 Standards and Technical Guidelines by MWAN

MWAN has published several Standards and Technical Guidelines covering various aspects of waste management activities, including treatment, recovery, storage, disposal, and classification. These guidelines provide essential frameworks for ensuring effective and compliant waste management practices. When considering the Sorting at Source of IW, it is crucial to reference and apply these standards where relevant, particularly in relation to waste treatment, recovery processes, landfill operations, and sector-specific waste streams.

### 2.1.4 MODON Regulations of Industrial Cities

Specific regulatory requirements apply to entities operating within MODON-managed industrial cities. These regulations mandate comprehensive compliance measures such as demonstrating the capability to manage essential services, including Waste Treatment, as part of the operating license process. For construction and operational activities, MODON regulations stipulate stringent procedures, such as:

- Regulations of Industrial Cities:
    - Chapter 2: Development: Article 11: Requirements for Studies, Planning, and Designs of the Project: Item 4.9: Solid Waste Disposal System:
        - 9.1: Preparation of a technical report on the types of expected Waste types and disposal methods
        - 9.2: Preparation of a study to determine manual and mechanical equipment and containers for Waste collection and transportation
        - 9.3: Preparation of a study to determine the equipment and workers needed for Waste Management
    - Chapter 3: Operation: Article 4: Operator's Responsibilities:
        - Providing necessary equipment and tools for cleanliness and maintenance and Waste Management

### 2.1.5 RCJY Environmental Regulation

RCJY enforces stringent environmental and Waste Management regulations to ensure environmental protection and sustainability within its industrial cities. Industries must develop Waste Management plans focusing on minimization, Recycling, and safe disposal of Hazardous materials, alongside treating wastewater to meet quality standards prior to discharge. The specific regulations are available for all the operators within RCJY industrial cities.

## 2.2 Key International Agreements, Standards, and Regulations

KSA aligns its Waste Management practices with international agreements and standards to enhance environmental sustainability and compliance. These international standards play a crucial role in shaping Waste Management practices in various industries, including but not limited to:



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### 2.2.1 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal

The Convention emphasizes environmentally sound management practices for Hazardous Waste and categorizes residues arising from IW disposal operations as one of the categories of Waste to be controlled.

- Article 4: Requires minimising Waste production and ensuring environmentally sound management.

### 2.2.2 Dangerous Goods Regulations

The proper Sorting at Source of IW aligns with international Dangerous Goods Regulations (DGR), such as the International Maritime Dangerous Goods (IMDG) Code, the International Air Transport Association (IATA) Dangerous Goods Regulations, and the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR). These regulations provide guidelines to ensure the safe classification, handling, packaging, and transport of hazardous materials, directly applicable to Waste management practices. Key aspects include:

- **Classification of Hazardous Waste:** The DGR requires that all hazardous materials, including Waste, be accurately classified before transportation. This classification is based on the chemical properties, physical state, and specific hazards of the material. Sorting Hazardous Waste at the source involves identifying and categorising Waste streams according to these classifications. This initial step ensures that hazardous materials are handled appropriately throughout their lifecycle, from storage to final treatment or disposal.
- **Packaging and Segregation:** DGRs specify how different classes of hazardous materials must be packaged and segregated to prevent chemical reactions, leaks, or spills during transport. For example, incompatible substances, such as acids and bases, must be kept separate to avoid dangerous reactions. These requirements necessitate that Hazardous Waste is sorted correctly at the point of production to ensure materials are stored and packaged safely according to their compatibility, reducing risks during subsequent handling and transport.
- **Labelling, Documentation, and Data Management:** DGRs mandate that containers holding Hazardous Waste are clearly labelled and accompanied by appropriate documentation, detailing the nature of their contents and associated hazards. This includes maintaining records of the waste type, classification, quantity, and destination. Effective data management systems are essential for ensuring traceability, regulatory compliance, and accountability. By integrating data recording and reporting into the sorting process, IW can be properly tracked from its source to final treatment or disposal, enhancing compliance with international standards. Additionally, digitised tracking systems, as encouraged by DGRs, can facilitate real-time monitoring of Hazardous Waste during transport, improving safety and efficiency.
- **Safety and Risk Management:** The primary objective of the DGR is to minimise risks to human health and the environment throughout the handling, storage, and transport of hazardous materials. By ensuring that Hazardous Waste is correctly identified, documented, and sorted at the source, potential dangers such as chemical reactions, fires, and spills can be mitigated. This contributes to safer Waste storage and transport while ensuring that handlers and transporters are fully informed about the nature of the materials.

# 3 SORTING SYSTEM – TECHNICAL DESIGN

This section comprises the TGs that are applicable to the Sorting at Source of IW.

IW is generated by diverse manufacturing or industrial processes, exhibiting variable composition and characteristics reflecting the specific activities of the generation. Typically, the Waste will be classified as either Hazardous or non-hazardous.

Table 4 is a reproduction of Table 5-3 from the MWAN Technical Guidelines on Waste Classification which provides a list of IW Sources, and the types of IW materials produced.

*Table 4 Industrial Waste Sources and Types*

| Industrial Waste Sources | Type of Waste Material |
|---|---|
| Waste resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals | • Waste from mineral excavation.<br>• Waste from physical and chemical processing of metalliferous minerals.<br>• Waste from physical and chemical processing of non-metalliferous minerals.<br>• Drilling muds and other drilling Waste. |
| Waste from food preparation and processing | • Waste from the preparation and processing of meat, fish, and other foods of animal origin.<br>• Waste from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing, conserve production, yeast and yeast extract production, molasses preparation and fermentation.<br>• Waste from sugar processing.<br>• Waste from the dairy products industry.<br>• Waste from baking and confectionery industry.<br>• Waste from the production of non-alcoholic beverages (except coffee, tea, and cocoa). |
| Waste from wood processing and the production of panels and furniture, pulp, paper, and cardboard | • Waste from wood processing and the production of panels and furniture.<br>• Waste from wood conservation.<br>• Waste from pulp, paper and cardboard production and processing. |
| Waste from the leather, fur, and textile industries | • Waste from the leather and fur industry such as: flashings and lime split Waste, tanning liquor, sludges etc.<br>• Waste from the textile industry such as Waste from composite materials, organic matter from natural products, dyestuffs and pigments, sludges etc. |
| Waste from petroleum refining, natural gas purification and pyrolytic treatment of coal | • Waste from petroleum refining such as desalter sludges, tank bottom sludge, acid tars, boiler feedwater sludges, bitumen etc.<br>• Waste from natural gas purification such as Waste containing mercury, sulphur, and others.<br>• Waste from pyrolytic treatment of coal such as acid tars, other tars, Waste from cooling columns etc. |
| Waste from inorganic chemical processes | • Waste from manufacture, formulation, supply, and use (MFSU) of acid.<br>• Waste from the MFSU of bases. |

FINAL DRAFT

| Industrial Waste Sources | Type of Waste Material |
|---|---|
| | • Waste from the MFSU of slats and their solutions and metallic oxides.<br>• Waste from the MFSU of sulphur chemicals, sulphur chemical processes and desulphurisation processes.<br>• Waste from the MFSU of silicon and silicon derivatives.<br>• Waste from the MSFU of phosphorous chemicals and phosphorous chemical processes.<br>• Waste from the MFSU of nitrogen chemicals, nitrogen chemical processes and fertiliser manufacture.<br>• Others. |
| Waste from organic chemical processes | • Wastes from the manufacture, formulation, supply, and use (MFSU) of basic organic chemicals.<br>• Wastes from the MFSU of plastics, synthetic rubber, and man-made fibres.<br>• Wastes from the MFSU of organic dyes and pigments; Wastes from the MFSU of organic plant protection products, wood preserving agents and other biocides.<br>• Wastes from the MFSU of pharmaceuticals.<br>• Wastes from the MFSU of fats, grease, soaps, detergents, disinfectants, and cosmetics.<br>• Wastes from the MFSU of fine chemicals and chemical products not otherwise specified. |
| Waste from the manufacture, formulation, supply and use of coatings, adhesives, sealants, and printing inks | • Waste from MFSU and removal of paint, varnish, and other coatings.<br>• Waste from MFSU of printing inks.<br>• Waste from MSFU of adhesives and sealants. |
| Waste from the photographic industry | • Water based developer and activator solutions, fixer solutions, photographic film and paper containing silver or silver compounds, single-use cameras without batteries, bleach solutions and bleach fixer solutions. |
| Waste from thermal processes | • Waste from power stations and other combustion plants; Waste from the iron and steel industry.<br>• Waste from aluminium thermal metallurgy.<br>• Waste from lead, zinc, and copper thermal metallurgy; Waste from silver, gold, and platinum thermal metallurgy; Waste from other non-ferrous thermal metallurgy.<br>• Waste from casting of ferrous and non-ferrous pieces.<br>• Waste from manufacture of glass products, ceramic goods, bricks, tiles, construction products, cement, lime and plaster and articles and products made from them.<br>• Waste from crematoria. |
| Waste from chemical surface treatment and coating of metals and other materials | • Waste from chemical surface treatment and coating of metals and other materials.<br>• Waste from non-ferrous hydrometallurgical processes.<br>• Sludges and solids from tempering processes. |

FINAL DRAFT

| Industrial Waste Sources | Type of Waste Material |
|---|---|
| | • Waste from hot galvanising processes. |
| Waste from shaping and physical and mechanical surface treatment of metals and plastics | • Waste from shaping and physical and mechanical surface treatment of metals and plastics.<br>• Waste from water and steam degreasing processes. |
| Waste from Waste management facilities | • Waste from incineration or pyrolysis of Waste.<br>• Waste from physic-chemical treatment of Waste (including dechromatation, decyanidation, and neutralisation).<br>• Stabilised/solidified Waste.<br>• Vitrified Waste and Waste from vitrification; Waste from aerobic treatment of solid Waste; Waste from anaerobic treatment of Waste; Landfill leachate.<br>• Others. |

## 3.1 Sorting at Source Specification for IW

The Sorting at Source of IW must be performed as close to the point of production as possible by IW Producers. This process is complex due to the wide variety of IW generated from different industrial activities, which can vary significantly in their physical and chemical properties, as well as their composition. Some IW contains Hazardous substances that require specialised handling and segregation procedures to ensure Health and Safety and to mitigate the risk of adverse reactions.

This section details the necessary requirements for implementing a Sorting at Source system at IW Producer facilities to ensure proper and effective Sorting at Source of Waste streams.

### 3.1.1 Waste Audit, Identification, and Characterisation

The first step in designing a Sorting at Source specification is to conduct a Waste Production Audit to identify, characterise, and classify the types and quantities of IW produced. This process ensures that IW is properly managed, classified, and sorted at the point of production. The following steps must be undertaken:

#### 3.1.1.1 Waste Audit

- **Sample Period:** Select a sample period to collect data during normal operations.
- **Sampling Team:** Appoint a responsible individual or team to carry out the Waste audit.
- **Supplies:** Identify all supplies required for the audit, such as scales and personal protective equipment (PPE).
- **Available Data:** Review existing data on Waste production rates, Waste collections, and the types of IW materials generated.
- **Designated Areas:** Identify activities and locations within the facility that generate IW.
- **IW Types:** Identify the types of IW materials generated by each process.
- **Map Waste Flow:** Track the journey of Waste from production to sorting and disposal.
- **Material Categories:** Separate Waste into distinct categories (e.g., plastics, metals, cardboard, organic materials).
- **Data Collection:** Collect and document data on the types of Waste and estimate the quantities produced.
- **Analyse:** Analyse collected data to determine the types and quantities of IW produced.

FINAL DRAFT

- **Classification:**
    - Classify IW according to the provisions of Chapter IV - Section 3 (Articles 49–64) of the Implementing Regulations (IR) of the Waste Management Law (WML).
    - Refer to the MWAN Technical Guidelines on Waste Classification for additional guidance, if required.
    - Use industrial process knowledge and supporting documents, such as Material Safety Data Sheets (MSDSs), to classify IW as hazardous or non-hazardous.

**Hazard Properties:** Identify properties that render the Waste hazardous by consulting Annexes 1 to 5 in the IR of the WML.

### 3.1.2 Internal Routing for IW

Efficient and safe movement of IW from the point of production to temporary storage is essential to maintain compliance, safety, and operational efficiency. The following standards and guidelines (Table 5) are designed to ensure smooth and compliant IW transfer within facility that produces IW.

*Table 5: Standards and guidelines for smooth and compliant IW transfer within a facility that produces IW*

| | |
|---|---|
| Unhindered Movement | • Pathways and Access: Ensure designated IW movement routes are free from obstructions, allowing unhindered transfer of IW to storage areas.<br>• Segregation of Routes: Separate IW movement pathways from general personnel and operational traffic to minimise cross-contamination and safety hazards.<br>• Signage: Clearly mark IW movement routes with appropriate signage to guide workers and equipment operators. |
| Clean vs Dirty Routes | • Route Classification: Establish "clean" and "dirty" routes to separate IW movement from clean materials or finished products to prevent contamination.<br>• Dedicated Equipment: Use dedicated carts, bins, or conveyors for IW transfer to minimise the risk of cross-contamination between IW and non-IW materials.<br>• Cleaning and Maintenance: Regularly clean and maintain "dirty" routes to avoid build-up of IW residues that could create slip hazards or odours. |
| Gradient Requirements | • Safe Gradients: Pathways used for IW movement must have a gradient of no more than 1:12 to ensure safe handling, particularly when moving wheeled containers or equipment.<br>• Slip Resistance: Ensure all surfaces on IW movement routes are non-slip to prevent accidents, especially in wet or hazardous conditions. |
| Door and Access Points | • Door Size: Doors and access points along IW movement routes must be wide enough to accommodate the largest IW containers used (minimum recommended width of 1.2 metres).<br>• Automatic Doors: Consider installing automatic or sliding doors on primary IW movement routes to facilitate smooth transit and reduce manual handling efforts.<br>• Clearance: Maintain a minimum clearance height of 2.1 metres to ensure safe passage of IW handling equipment. |
| Contingency for Service Disruptions | • Backup Routes: Identify and maintain alternative routes in case of obstructions or maintenance work along primary IW movement pathways.<br>• Temporary Storage Areas: Establish contingency storage areas near key |

FINAL DRAFT

| | |
|---|---|
| | IW production points for short-term use during service disruptions.<br>• Communication Protocols: Implement protocols to inform relevant staff about route closures or disruptions promptly. |
| Equipment and Handling | • IW Handling Equipment: Provide suitable equipment, such as trolleys or forklifts, to move IW efficiently and safely within the facility.<br>• Training: Train staff on the correct use of IW handling equipment and safe IW transfer practices.<br>• Load Limits: Ensure that containers and equipment are not overloaded beyond their capacity to prevent spills or accidents during transport. |
| Environmental and Safety Considerations | • Ventilation: Ensure IW movement routes are well-ventilated, particularly for Hazardous Waste that may release fumes or odours.<br>• Spill Containment: Equip routes with spill kits and ensure staff are trained to respond promptly to spills during waste transfer.<br>• Lighting: Maintain adequate lighting along all IW movement routes to ensure visibility and worker safety. |
| Monitoring and Compliance | • Regular Inspections: Conduct routine inspections of IW movement routes to identify and address any obstructions, wear, or hazards.<br>• Record-Keeping: Maintain records of IW movement activities to support compliance audits and operational planning.<br>• Feedback Mechanisms: Establish a system for workers to report issues related to IW movement routes, such as damaged equipment or blocked pathways. |

### 3.1.3 Non-Hazardous IW

Non-hazardous IW must be sorted similarly to Municipal Solid Waste (MSW) by separating Waste streams into Mixed Residual Waste (MRW), Organic Waste (OW) and Dry Recyclable Materials (DRM). Refer to the MSW TGs for further details on the Sorting at Source of MSW. This approach aligns with KSA's Waste Management strategy, which prioritises Sorting at Source. Non-hazardous IW can be Sorted at Source into materials such as paper & cardboard, plastics, glass, and metals, which can either be handled at individual industrial facilities or through centralised systems at an industrial city level. DRM must be stored on-site or in designated areas within an industrial city.

### 3.1.4 Hazardous IW

Effective Sorting at Source of Hazardous IW must begin at the point of production, where Hazardous IW is identified and Sorted at Source. Establishing a structured system to aid decision-making is essential, utilising four decision trees to categorize:

- All Hazardous Wastes
- Hazardous articles
- Organic Waste streams
- Inorganic Waste streams

IW Producers must determine the nature and composition of their Hazardous Waste, including any Hazardous substances and properties (see Section 3).

For Hazardous Waste intended for Reuse, Recycling, or treatment, residues are treated as Waste from a new process. Articles that can be cleaned, repaired, or checked may be reused; if not, they must be Separated at Source and sent for appropriate Treatment or Disposal.

Organic Waste, similarly, can be prepared for Reuse or Recycling, such as through filtration or cleaning. If they cannot be reused, options include Recycling methods like oil regeneration or solvent distillation. If

FINAL DRAFT

Recycling is not possible, the Waste must be separated and directed to suitable Treatment or Disposal.

Inorganic Waste follow a similar pathway, where they may be recycled through specialised recovery processes or subjected to physical, chemical, or thermal treatment for final Disposal.

It is critical to prevent mixing or diluting different categories of Hazardous IW before any pre-treatment or final treatment. Hazardous substances must not be managed by dilution, and organic Hazardous fractions must remain separate from other Waste types. Proper storage is key to maintaining segregation, with specific procedures for collection, storage, and transportation—such as those required for asbestos Waste. A labelling system must be implemented to support safe handling and accurate identification during collection and storage (Figure 1).

### 3.1.5 Licensed Treatment Facility (LTF)

Different types of IW require different treatment processes for Recovery, Recycling, or Disposal. An appropriate LTF must be identified for each IW stream. All LTFs must obtain the MWAN permit and comply with the permit terms and conditions as detailed and provided in the IRs.

### 3.1.6 Level of segregation

The following steps must be taken to determine the necessary level of segregation:

- **Type of IW:** IW must be sorted by type. The mixing of different IW types is strictly prohibited.
- **Classification and Hazardous Properties**:
    - Hazardous IW must be segregated from non-hazardous IW.
    - IW with different Hazardous properties must be separated to avoid adverse reactions or contamination that could affect end Treatment or Recovery.
- **LTF:**
    - IW must be further sorted according to the LTF to which it is destined and in accordance with applicable acceptance criteria.

### 3.1.7 Containers

Containers and packaging must be provided for each IW category based on segregation requirements. The choice of packaging must consider the IW stream, volume, and the physical and Hazardous properties of the IW. All containers must be structurally sound, leakproof, impermeable to moisture, and strong enough to securely store the IW. The number of containers provided must reflect the volume of IW generated on site.

For Hazardous IW, containers and packaging must be approved to the United Nations (UN) standards and compliant with relevant transport regulations. The type and size of the container must be suitable for the IW volume and handling methods. For large quantities of IW, bulk storage solutions such as tankers, containers, storage bays, skips, or other vessels must be considered.

All containers must be clearly labelled with the IW type, date of generation, Hazardous properties, and any relevant warning labels.

Further guidance on container specifications is provided in Sections 3.1.7.1 and 2.2.2.

#### 3.1.7.1 Container Specifications and Sizes of Sorting Containers

The specifications for IW storage containers are outlined in Table 6 and Table 7 and summarised as follows.

- **Materials:** Containers such as drums, boxes, skips, and bins must be made from durable, weather-resistant materials. UV-resistant polyethylene is recommended for bins and plastic drums, while skips must be made from steel to ensure durability in various environmental conditions.
- **Capacity:** Containers must have a capacity appropriate for the volume of IW produced, the frequency of collection, and the available space at the storage location. They must be sized to

FINAL DRAFT

accommodate a full week's worth of sorted IW.

- **Number of Containers:** Separate containers must be provided for each sorting category at designated collection or storage locations to ensure proper segregation.

*Table 6 Skips and Roll-on/Roll-off Container Sizes for Non-Hazardous IW Sorting at Source*[1]

| Containers | Dimensions |
|---|---|
|  | • 1.8m x 1.6m x1m<br>• 2.5m x 1.6m x 1m<br>• 3.3m x 1.6m x 1m<br>• 3.7m x 1.6m x 1.3m<br>• 3.7m x 1.6m x 1.65m<br>• 4.2m x 1.6m x 1.65m<br>• 4.1m x 1.6m x 1.9m |
|  | • 15m$^3$: 6.1m x (L) x 2.4m (W) x 1.2m (H).<br>• 20m$^3$: 6.1m (L) x 2.4m (W) x 1.5m (H).<br>• 25m$^3$: 6.1m (L) x 2.4m (W) x 1.8m (H).<br>• 30m$^3$: 6.1m (L) x 2.4m (W) x 2.1m (H).<br>• 40m$^3$: 6.1m (L) x 2.4m (W) x 2.6m (H). |

*Table 7 Containers Suitable for the Sorting at Source of Hazardous IW*

| | |
|---|---|
| **Jerricans (1L/5L/10L/25L)**<br>• UN approved for hazardous IW, designed for storing **small quantities of liquids**.<br>• Made from HDPE or metal, with container material compatibility required based on the Waste type and its hazardous properties; for instance, corrosive substances should not be stored in metal jerricans.<br>• Labelling: Each jerrican must be clearly labelled.<br>• Spill Prevention: Ensure jerricans are securely sealed to prevent leaks, with secondary containment.<br>• Ventilation for Volatile Liquids: Jerricans containing volatile substances should include venting mechanisms.<br>• Inspection and Maintenance: Regularly inspect jerricans. |  |
| **Drums (60L/120L/220L)**<br>• UN approved for hazardous IW, suitable for containing **both liquids and solids**.<br>• Made from plastic or metal with tight head design to prevent leaks and spills.<br>• The drum material must be compatible with the Waste type and its hazardous properties; for example, corrosive substances should not be stored in metal drums.<br>• Stacking and Stability: Drums should be stable and securely stacked if needed, with adequate structural integrity to avoid tipping or collapsing.<br>• Labelling: All drums must be clearly labelled with hazard symbols and Waste classification for easy identification.<br>• Spill Control: Use secondary containment measures, such as spill trays or bunds, to manage potential leaks or spills during storage.<br>• Inspection and Maintenance: Drums should be regularly inspected for damage or corrosion, especially when storing hazardous Waste. | <br>Containers Suitable for Liquid Hazardous IW (with secondary containment) |

[1] *Refer to the MWAN TGs for MSW for further guidance on suitable containers.*

FINAL DRAFT



**Intermediate Bulk Containers (IBC) - 1,000L**

- UN approved for hazardous IW, designed for storing **larger quantities of liquids**.
- Constructed from plastic or metal, with container material compatibility required based on Waste type and hazardous properties; for example, corrosive substances should not be stored in metal IBCs.
- Ventilation: IBCs containing volatile or reactive materials should have pressure-relief or venting mechanisms to prevent pressure build-up.
- Stacking and Stability: Ensure IBCs are stable and secure for stacking, if necessary, with sufficient structural integrity to prevent collapse.
- Labelling: Each IBC must be clearly labelled with hazard symbols and Waste classification for easy identification.
- Secondary Containment: Use secondary containment measures to manage potential leaks or spills from IBCs containing hazardous liquids.



IBCs with example of Secondary Containment



**Bulk Bags (0.25 to 2m$^3$)**

UN approved for hazardous IW, designed for solid Waste containment.

Must be made from materials compatible with the Waste type and hazardous properties. For example, bulk bags are unsuitable for corrosive materials or fine powders that may escape woven fabric.

Bags should have adequate strength, stability, and inner lining (if needed) to prevent leaks, particularly for fine or dusty materials.

All bags must be clearly labelled with hazard symbols and classification and equipped with lifting loops for safe handling by forklifts or cranes.



**COSHH Cabinets**[2]

Designed for the safe storage of hazardous substances in compliance with the Control of Substances Hazardous to Health (COSHH) regulations.

Constructed from robust, corrosion-resistant materials with a secure, lockable design to prevent unauthorised access and ensure containment of hazardous materials.

*Ventilation:* Cabinets should include built-in ventilation or air filtration to prevent the build-up of fumes from volatile substances, reducing risks of inhalation or fire hazards.

*Segregation of Incompatible Substances:* COSHH cabinets should be organised to keep incompatible materials separated to prevent dangerous reactions, such as acids stored separately from alkalis.

*Labelling:* Each substance within the cabinet must be clearly labelled, and the cabinet itself should have external hazard symbols indicating the types of substances stored (e.g., flammable, toxic).

*Spill Containment:* Cabinets should have integrated spill containment trays or sumps to collect any accidental leaks, preventing hazardous substances from escaping into the work environment.

*Fire Resistance:* Use fire-resistant cabinets if storing flammable materials, to prevent the spread of fire in case of an emergency.

*Inspection and Maintenance:* Regularly inspect cabinets for signs of damage, corrosion, or contamination, and ensure locks and ventilation





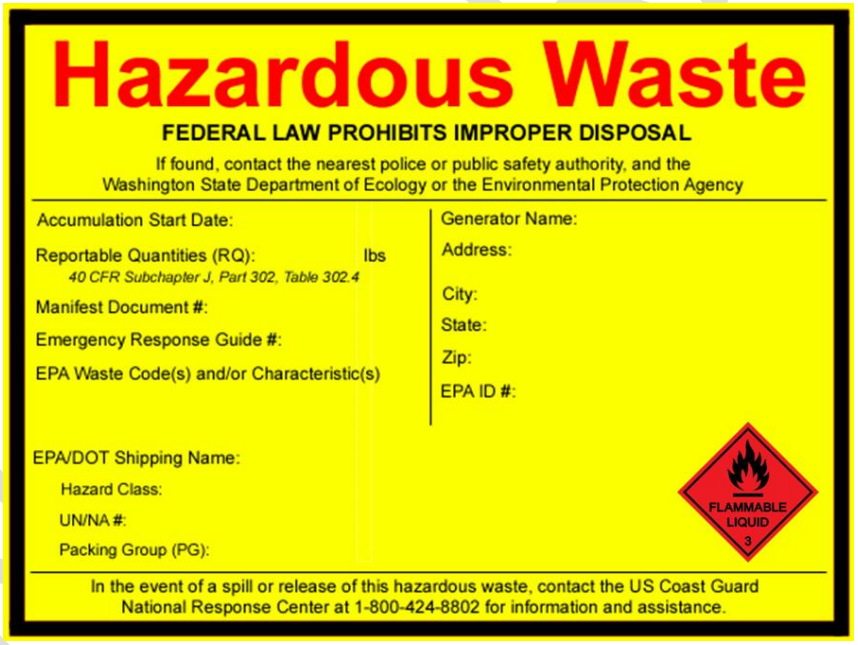

[2] *Source – https://direct2u.co.uk/blog/safety/harmful-substances-coshh-cabinet/*

FINAL DRAFT

| | |
|---|---|
| systems are functioning properly. | |

- **Labelling:** All Hazardous IW containers must be clearly labelled to help ensure safety is maintained in the storage and transport of such Wastes. Hazardous IW labels must include data such as:
    - *Signal Word:* Indicates the level of hazard, such as "Danger" or "Warning."
    - *Hazard Statements:* Describe the nature and degree of the hazard, e.g., "Flammable liquid and vapor."
    - *Precautionary Statements:* Provide guidance on safe handling, storage, and emergency measures.
    - *Pictograms:* Standardised symbols representing specific hazards, such as flames for flammables or skull and crossbones for toxicity.
    - *Product Identifier:* The name or identification number of the substance.
    - *Supplier Information:* Details of the IW Producer, including address and contact information.
- An example of a Hazardous Waste label utilised in the USA is illustrated in Figure 1.

*Figure 1 Sample of a Hazardous Waste Label*




### 3.1.8 Temporary Storage for IW

For guidance on the temporary storage of Hazardous Waste please refer to the MWAN Technical Guidance on Temporary Storage of Hazardous Wastes. In addition to this, the following must be observed when planning for the storage of IW.

#### 3.1.8.1 IW Storage Compatibility

Segregating Hazardous and non-hazardous IW during storage is crucial for maintaining safety, compliance, and environmental protection. Hazardous IW poses significant risks due to its potentially toxic, flammable, corrosive, or reactive properties. If mixed with non-hazardous IW or other Hazardous classes, these materials can react in unpredictable ways, leading to chemical reactions, fires, explosions, or the release of harmful substances. By separating IW into different Hazardous classes, the risk of adverse chemical reactions is minimised, which is essential for safeguarding both the environment and human health. When

classifying IW, it is essential to carefully consider the Waste's properties and consult the relevant MSDSs wherever possible to identify all potential Hazards. Proper classification and understanding of chemical compatibilities are critical to preventing dangerous reactions during storage and handling. Table 8 presents an overview of the IW that must and must not be stored together and the distances that must be maintained between certain classes of IW. Some specific issues to consider include:

- ***Acids/Hypochlorite:*** When acids are mixed with hypochlorite compounds, chlorine gas, a highly toxic and corrosive substance, can be generated. This reaction poses severe health risks, including respiratory damage, and must be strictly avoided by keeping these materials separate.
- ***Acid/Cyanides:*** The combination of acids and cyanides can produce hydrogen cyanide gas, which is extremely poisonous and potentially lethal even in small quantities. This gas can cause immediate harm if inhaled, making it critical to store these substances separately.
- ***Acid/Alkalis:*** Mixing acids with alkalis (bases) generates significant heat due to the exothermic neutralization reaction. This sudden release of heat can lead to container damage or cause other substances to ignite or react dangerously, so these materials must be stored apart.
- ***Acids/Sulphides:*** When acids come into contact with sulphides, they can release hydrogen sulphide gas, a highly toxic and flammable gas with a characteristic rotten egg smell. This gas can be hazardous to both health and safety, necessitating strict separation of these materials in storage.

By considering these potential reactions and segregating incompatible materials, the risks of dangerous incidents during the storage and handling of IW can be significantly reduced. Proper classification and segregation practices are essential for maintaining a safe and compliant Waste Management system.

*Table 8 Storage compatibility for different hazardous properties*[3]

| **Hazardous Property** | | **1** | **2.1** | **2.2** | **2.3** | **2.4** | **3** | **4.1** | **4.2** | **4.3** | **5.1** | **5.2** | **6.1** | **8** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Explosives | **1** | | | | | | | | | | | | | |
| Flammable Gas | **2.1** | | | | 3m | 3m | 5m | 5m | 5m | 5m | 3m | | 3m | 5m |
| Non-Toxic, Non-Flammable Gases | **2.2** | | | | | | 5m | 5m | 5m | 5m | 3m | | 3m | 5m |
| Toxic Gas | **2.3** | | 3m | | | 3m | 5m | 5m | 5m | 5m | 3m | | 3m | 5m |
| Oxidizing Gas | **2.4** | | 3m | | 3m | | 5m | 5m | 5m | 5m | 3m | | 3m | 5m |
| Flammable liquids | **3** | | 5m | 5m | 5m | 5m | | 3m | 5m | 5m | 5m | | 5m | 3m |
| Flammable solids | **4.1** | | 5m | 5m | 5m | 5m | 3m | | 3m | 5m | 3m | | 3m | |
| Spontaneously combustible | **4.2** | | 5m | 5m | 5m | 5m | 5m | 3m | | 5m | 5m | | 3m | 3m |
| Dangerous when wet | **4.3** | | 5m | 5m | 5m | 5m | 5m | 5m | 5m | | 5m | | 3m | 5m |
| Oxidizing | **5.1** | | 3m | 3m | 3m | 3m | 5m | 3m | 5m | 5m | | | 3m | 3m |
| Pyrophoric | **5.2** | | | | | | | | | | | | | 3m |
| Toxic | **6.1** | | 3m | 3m | 3m | 3m | 5m | 3m | 3m | 3m | 3m | | | 5m |
| Corrosive | **8** | | 5m | 5m | 5m | 5m | 3m | | 3m | 5m | 3m | | 5m | |
| Other Hazardous IW | **N/A** | | | | | | | | | | | | | |

The key to Table 8 is provided below:

| | |
|---|---|
| | Store together |
| | Distance between containers ≥5m |
| | Distance between containers ≥3m |
| | Isolate/store separately |
| | May not be compatible check the MSDS |

[3] *Federal Institute for Occupational Safety and Health (https://www.baua.de/EN/Service/Technical-rules/TRGS/TRGS-510.html)*

## 3.2 Health and Safety Considerations for IW Sorting at Source

The Sorting at Source of IW presents various health and safety challenges that must be effectively managed to protect workers, the environment, and the surrounding community. IW Producers are responsible for implementing robust health and safety practices aligned with these TGs, local regulations, and international best practices to mitigate risks associated with Hazardous and non-hazardous IW handling. This section outlines essential health and safety measures that IW Producers must adopt as part of their Sorting at Source processes.

### 3.2.1 Risk Assessment and Hazard Identification

IW Producers must conduct comprehensive risk assessments for all sorting activities at the site. This includes:

- *Identifying Hazards:* Assess the types of IW Produced, particularly Hazardous Wastes, and identify potential risks such as flammability, toxicity, and reactivity.
- *Assessing Exposure:* Evaluate worker exposure to Hazardous materials and physical risks, such as handling heavy containers and exposure to sharp objects.
- *Control Measures:* Develop control measures based on identified risks, using appropriate safety protocols, PPE, and engineering controls where necessary.

### 3.2.2 Use of Personal Protective Equipment (PPE)

PPE is essential to ensure the safety of personnel involved in the Sorting at Source of IW. IW Producers must:

- *Provide Appropriate PPE:* Ensure workers have access to the necessary PPE, including gloves, safety goggles, respirators, high-visibility vests, and protective footwear.
- *Training on PPE Use:* Provide training on the correct use, maintenance, and disposal of PPE to ensure it is effective in protecting workers.
- *Regular Inspections:* Implement regular inspections and replacements of PPE to maintain safety standards and ensure equipment is in good condition.

### 3.2.3 Safe Handling and Storage Practices

Proper handling and storage of IW, particularly Hazardous IW, are critical to prevent accidents and contamination. IW Producers must:

- *Designate Sorting and Storage Areas:* Clearly define areas for sorting and storing different types of IW, with separate zones for Hazardous and non-hazardous IW.
- *Prevent Cross-Contamination:* Ensure Hazardous and non-hazardous IW streams are kept separate to prevent contamination and unintended reactions.
- *Containment and Labelling:* Use structurally sound, labelled containers to store IW. Labels must clearly indicate the contents, hazards, and any special handling instructions.
- *Spill Prevention and Control:* Have spill control measures in place, such as spill kits and containment systems, to manage accidental releases.

### 3.2.4 Ventilation and Air Quality Management

To mitigate exposure to harmful vapours and dust, IW Producers should ensure that IW storage areas have adequate ventilation and air quality controls:

- *Ventilation Systems:* Install ventilation systems to reduce the concentration of airborne contaminants, especially when handling volatile or dusty Waste materials.

FINAL DRAFT

- *Dust Suppression:* Implement dust suppression techniques where necessary, such as water sprays or extractors, to minimise inhalation risks.
- *Monitoring Air Quality:* Regularly monitor air quality in storage areas to ensure it complies with health and safety standards.

### 3.2.5 Emergency Preparedness and Response

IW Producers must be prepared to handle emergencies, such as chemical spills, fires, or worker injuries, which may occur during sorting activities:

- *Emergency Plans:* Develop and communicate an emergency response plan that includes procedures for evacuations, containment of spills, and first-aid response.
- *Fire Safety:* Equip sorting areas with appropriate fire extinguishers and ensure that fire exits are accessible and clearly marked. Workers must be trained in fire safety protocols and know the location of fire-fighting equipment.
- *First Aid Facilities:* Provide accessible first aid kits and stations within the sorting area, with trained personnel available to administer basic first aid if needed.

### 3.2.6 Training and Competency Development

IW Producers must ensure that all personnel involved in the handling and sorting of IW process are competent and adequately trained:

- *Initial and Ongoing Training:* Provide initial training for new staff and ongoing training for existing personnel to ensure they understand safety protocols, IW handling techniques, and the importance of correct sorting practices.
- *Hazard Communication:* Educate workers on hazard communication standards, including understanding Material Safety Data Sheets (MSDS) and recognising hazard symbols.
- *Regular Safety Drills:* Conduct regular safety drills, including fire, spill response, and evacuation drills, to ensure all personnel are familiar with emergency procedures.

### 3.2.7 Monitoring and Continuous Improvement

Health and safety in IW sorting must be continuously monitored and improved to address new risks and maintain high safety standards:

- *Routine Inspections:* Conduct routine inspections of IW storage areas, equipment, and PPE to identify and rectify any safety issues.
- *Incident Reporting and Investigation:* Establish a system for reporting and investigating incidents or near-misses to prevent recurrence and improve safety practices.
- *Feedback Mechanism:* Encourage workers to provide feedback on safety practices and participate in discussions to improve health and safety protocols.

Health and safety are paramount in the Sorting at Source of IW. By implementing these safety measures, IW Producers can ensure that Sorting at Source practices minimise risks to workers, the environment, and the wider community, while contributing to a more sustainable Waste management system. Regular training, emergency preparedness, and continuous monitoring are essential components of an effective health and safety strategy for IW sorting.

FINAL DRAFT

# 4 GOVERNANCE MODEL – ROLES AND RESPONSIBILITIES

Efficient governance plays a crucial role in improving operational efficiency and promoting transparency in Waste Management. By defining clear roles for each stakeholder, fostering effective collaboration, and ensuring alignment, this governance model aims to ensure effective compliance with regulations to promote active participation in the practice of IW Sorting at Source.

## 4.1 Key Stakeholders

These TGs are to be used by various stakeholder groups, especially those involved directly or indirectly in the Sorting at Source of IW. They are:

- Waste and Environmental Sector Regulators
- Public Stakeholders and Competent Authorities
- Service Providers
- Waste Producers

### 4.1.1 Waste and Environmental Sector Regulators

This group includes regulatory bodies and authorities directly involved and mandated to oversee and manage the environment and Waste sectors according to regulatory provisions within KSA. Such as MWAN, Ministry of Environment, Water and Agriculture (MEWA), and the National Center for Environmental Compliance (NCEC). Their main roles and responsibilities are defined in Section 4.2.

### 4.1.2 Public Stakeholders and Competent Authorities

This group includes authorities regulating various aspects beyond the Waste Management sector but indirectly related to Waste sector, such as such as MODON, RCJY, Ministry of Municipalities and Housing (MoMAH), Regional Amanahs, and Transport General Authority (TGA).

### 4.1.3 Service Providers

This group consisting of Service Providers licensed or permitted by MWAN is split into four main categories under the respective licenses or permits for certain WM activities such as:

- **Waste Collectors:** Companies that have obtained MWAN license for the collection and transportation of Hazardous Waste or MWAN license for the collection and transportation of Non-Hazardous Waste.
- **Recycling Providers**: Companies that have obtained MWAN permits for Hazardous Waste treatment or the construction and operations of Recycling and Treatment facilities.
- **Waste Treatment/ Disposal Providers**: Companies that have obtained MWAN licenses for Treatment/final Disposal of Hazardous Waste or MWAN licenses for final disposal of IW.
- **Traders of Recyclables:** Companies that have obtained MWAN licenses for the storage and trade of recyclable materials.

A detailed list of licensed Waste Management companies is provided on the official MWAN website[4]. Their roles and responsibilities are defined in Section 4.2.

### 4.1.4 Waste Producers

This group consists of the main categories as stipulated below:

- **General IW Producers:** This group includes all industries and businesses that generate IW as a byproduct of their manufacturing, processing, or operational activities. General IW Producers can span various sectors, including manufacturing, construction, and chemicals, and are required to

[4] *mwan.gov.sa*

FINAL DRAFT

adhere to national regulations and standards for the management and disposal of IW.

- **Affiliated IW Producers:** This category specifically encompasses industries that are affiliated with regulatory bodies, such as RCJY and MODON. These affiliated IW Producers must comply with additional requirements and protocols specific to their regulatory authorities. This includes adherence to enhanced Waste Management practices and reporting obligations tailored to the operational and environmental standards set by RCJY or MODON within designated industrial zones.

## 4.2 Roles and Responsibilities

The roles and responsibilities of key Stakeholders and Stakeholder groups are presented in Table 9.

*Table 9 Governance Model - Roles and Responsibilities (RACI Matrix)*

| Activity | MWAN | NCEC | MIM | MoMAH/ Amanah | RCJY/ MODON | Service Providers | Waste Producers |
|---|---|---|---|---|---|---|---|
| **Licensing Service Providers** | R (Licensing oversight and approval) | R (Environmental permits) | A (Licenses for recycling facilities) | C (Site approvals) | C (Site-specific permits) | C (Obtain licenses and permits) | I (Compliance with licensed services) |
| **Developing and Approving TGs** | R (Development and updates) | C (Environmental considerations) | C (Consultation) | C (Consultation) | C (Consultation) | I (Compliance with TGs) | I (Adherence to TGs) |
| **Providing Waste Containment Equipment** | C (Guidance in TGs) | I | C (Standards) | A (Site specifications) | R (Standards for containers) | R (Provision of equipment, e.g., containers) | A (Purchase and use of compliant equipment) |
| **Sorting at Source Process** | R (Monitoring compliance) | I | I | C (Local oversight) | C (Local oversight) | A (Ensure sorted Waste is compliant) | R (Implement sorting practices on-site) |
| **Collection and Transportation** | R (Monitoring and data collection) | I | I | C (Transportation standards) | C (Issue permits for transportation within areas) | R (Collection and transport) | A (Contract service providers) |
| **Monitoring and Overseeing** | R (Compliance enforcement) | C (Environmental monitoring) | I | C (Local oversight) | C (Supervision within jurisdiction) | A (Report non-compliance) | R (Compliance with regulations) |
| **Data Recordkeeping and Tracking** | R (Unified data management system) | I | I | C (Reporting requirements) | C (Local data submission) | R (Data recording and submission) | A (Provide data as required) |
| **Raising Awareness and Capacity Building** | R (Lead campaigns and initiatives) | C (Environmental input) | C (Support initiatives) | C (Support initiatives) | C (Promote awareness within regions) | C (Training for staff) | A (Participate in training and awareness) |

**RACI Matrix Key**

R (Responsible): The entity responsible for performing the task or activity. They ensure the work is completed but may involve others in executing the task.

A (Accountable): The entity ultimately answerable for the task or decision. This role has final ownership and ensures that the task is completed to the required standard. There is only one "Accountable" per task.

C (Consulted): The entities who provide input, guidance, or expertise to help complete the task. These

FINAL DRAFT

entities are consulted before decisions or actions are taken.

I (Informed): The entities who need to be kept informed about the progress or outcome of the task. They do not contribute directly to the work but need to remain updated.

FINAL_DRAFT

# 5 ENFORCEMENT AND COMPLIANCE

The effectiveness of the Sorting at Source of IW in KSA is heavily dependent on robust enforcement and compliance mechanisms. This chapter outlines the roles, responsibilities, and processes required to ensure adherence to established standards and guidelines, supporting a sustainable Waste Management system. Key components include regular monitoring, inspections, data tracking, and appropriate enforcement measures such as penalties, sanctions, and incentive programs.

## 5.1 Role of Key Authorities

### 5.1.1 Ministry of Industry and Mineral Resources (MIM) and Ministry of Municipalities and Housing (MoMAH)

- ***Licensing:*** MIM and MoMAH are critical authorities in licensing IW Producers and overseeing their activities. MIM focuses on industries, including licensing Waste Management facilities and recycling plants. MoMAH, on the other hand, oversees the compliance of Waste Management practices within urban and rural areas.
- ***Oversight and Enforcement:*** MIM and MoMAH have a crucial role in enforcing compliance by ensuring that IW Producers adhere to environmental regulations. They monitor the activities of licensed entities, conduct site inspections, and ensure compliance with safety and environmental standards, making their roles central.

### 5.1.2 National Center for Waste Management (MWAN)

- ***Regulatory Oversight:*** MWAN is responsible for developing TGs and managing the overall regulatory framework for Waste Management. While MWAN is the central regulatory authority for WM sector, its inspectors often need to coordinate with MIM, MoMAH and other Competent Authorities before conducting inspections within industrial facilities.
- ***Inspection Guidelines:*** MWAN sets the standards and guidelines on inspections of Waste Management facilities, further defining the standards for monitoring and enforcing Waste Management practices.

## 5.2 Enforcement Measures

Enforcement measures involve a combination of penalties, both monetary and non-monetary, and incentives to ensure compliance with IW Sorting at Source TGs. These measures are applied based on the severity of violations and the impact on environmental and public health.

### 5.2.1 Monitoring and Inspection

Regular monitoring and inspections are essential for verifying adherence to sorting standards and guidelines. Inspections may be routine or unannounced and are conducted by trained inspectors from MWAN, MIM, MoMAH, RCJY, and other competent authorities.

### 5.2.2 Inspection Focus Areas

Inspections focus on compliance with TGs, proper sorting of Hazardous and non-hazardous Waste, cleanliness, adherence to safety protocols, and overall organisation of sorting areas.

### 5.2.3 Coordination of Inspections

MWAN inspectors must coordinate with MIM and MoMAH before inspecting industrial sites to ensure seamless operations and avoid overlap. MIM and MoMAH's deep understanding of industrial activities enhances the effectiveness of the inspection process, ensuring that compliance measures are tailored to industry-specific risks.

FINAL DRAFT

Table 10 lists the RACI Matrix for Monitoring and Inspection.

*Table 10 RACI Matrix for Monitoring and Inspection*[5]

| Activity | IW Producers | MWAN Inspector | MODON Inspector | WM Service Providers | RCJY Inspector | MIM | MoMAH |
|---|---|---|---|---|---|---|---|
| Develop a Sorting at Source system | R | A | C | C | C | C | C |
| Routine and Unannounced Inspections | C | R | R | C | R | C | C |
| Compliance with WML, WML IRs, and MWAN TGs | I | A | I | C | I | C | C |
| Monitoring IW sorting During Collection | I | C | I | A | I | C | C |
| Conducting Physical Inspections of Sorting Areas | C | R | I | R | I | C | C |
| Evaluating IW Management Records | C | I | I | I | I | I | I |
| Cross-Referencing Logged IW Data with Practices | C | I | I | I | I | I | I |
| Interviewing Personnel for Compliance Insights | C | I | I | I | I | I | I |
| Ensuring Cleanliness and Organisation of Sorting | C | R | A | A | A | C | C |
| Assessing Effectiveness of IW Separation Practices | C | R | I | R | I | C | C |
| Verifying Standardised Labelling and Traceability | C | R | I | I | I | C | C |

### 5.2.4 Reporting and Data Management

Effective reporting and data management are vital for maintaining transparency and regulatory compliance in the Sorting at Source of IW. The following key data points must be reported by IW Producers and Service Providers:

- *Type and Quantity of Waste:* This includes the classification of Waste streams (e.g., Hazardous, non-hazardous) and detailed records of the quantities produced and sorted.
- *Sorting Compliance Data:* Records should show compliance with these and other relevant Sorting at Source TGs, including data on Sorting at Source practices, Recycling rates, and adherence to health and safety standards.
- *Tracking and Transportation Data:* Information on the transportation of IW, such as dates of transfer, collection, and delivery to licensed facilities, must be documented to ensure a clear chain of custody.
- *Incident and Violation Reports:* Any issues related to non-compliance, such as unsorted IW or mixing of Hazardous materials, must be reported immediately, along with corrective actions taken.

[5] *See RACI Matrix key attached to Table 9*

FINAL DRAFT

#### 5.2.4.1 Reporting Frequency

- Monthly reports must be submitted to MWAN by IW Producers and service providers, summarising IW types, quantities, and compliance status.
- Quarterly reports must include additional insights on operational challenges, corrective actions, and performance improvements.
- Annual reports must be comprehensive, detailing all compliance, Sorting at Source data, and any environmental impact assessments.

#### 5.2.4.2 Responsibilities

- IW Producers are responsible for accurately recording and reporting data related to Sorting at Source practices at the point of IW production.
- Service Providers must report on collection, transportation, treatment, and disposal compliance.
- MWAN will oversee data collection, maintains a unified tracking system, and review reports to verify accuracy and enforce compliance.

### 5.2.5 Penalties and Sanctions

Effective enforcement of the Sorting at Source of IW in KSA requires a structured system of penalties and sanctions to ensure compliance with the WML and its IRs. Penalties for non-compliance are outlined in MWAN's Schedule of Violations[6], with classifications based on the severity of the violation and its impact on public health, environmental safety, and Waste management efficiency.

Examples of Violations and Penalties include:

- Failure to Segregate Hazardous Waste at Source:
    - Penalty: Fines ranging from SAR 100,000 to SAR 1,000,000.
    - Additional Sanctions: Possible suspension of licenses for up to six months for repeated violations.
- Unauthorised Handling of Hazardous Waste:
    - Penalty: Fines between SAR 1,000,000 and SAR 10,000,000.
    - Additional Sanctions: Permanent revocation of licenses or permits for severe cases.
- Inadequate Labelling of Hazardous Waste Containers:
    - Penalty: Fines between SAR 1,000 and SAR 10,000.
    - Purpose: To ensure correct handling and identification of hazardous materials, reducing the risk of accidents and contamination.
- Storage of Hazardous Waste in Unauthorised Facilities:
    - Penalty: Fines up to SAR 1,000,000.
    - Additional Sanctions: License suspension for six months or permanent revocation for repeated violations.
- Transporting Hazardous Waste without Proper Licenses:
    - Penalty: Fines between SAR 100,000 and SAR 1,000,000.

[6] *https://mwan.gov.sa/en/violation*

FINAL DRAFT

- Additional Sanctions: Suspension of the transporter's license for up to six months.

MIM and MoMAH have the authority to impose these penalties, especially within industrial facilities under their jurisdiction. They play a critical role in ensuring penalties are applied fairly and in alignment with national standards to promote compliance and protect public health and the environment.

This system of penalties and sanctions provides a robust framework to enforce compliance and its purpose is to encourage IW Producers and Service Providers to adhere to proper Waste sorting practices.

## 5.3 Compliance Mechanisms

To support compliance, several mechanisms focus on awareness, training, and continuous improvement in Sorting at Source practices:

- *Regular Compliance Training:* MIM, MoMAH, and MWAN jointly of separately organise workshops for IW Producers and Service Providers, covering the latest Sorting at Source TGs, safety standards, and regulatory requirements.
- *Awareness Campaigns:* Targeted campaigns increase awareness among industrial Stakeholders on the importance of Sorting at Source for IW, highlighting the environmental and regulatory benefits.
- *On-site Technical Support:* Technical support visits for new facilities or those with prior violations to assist in setting up compliant IW sorting systems.
- *Certification Programs:* Issuance of certificates to facilities demonstrating consistent compliance with sorting standards, recognising and encouraging best practices.
- *Periodic Reviews and Updates:* MWAN, in consultation with MIM and MoMAH, regularly updates TGs based on evolving standards and industry feedback, ensuring alignment with international best practices and continuous improvement.

These compliance mechanisms ensure all Stakeholders understand, implement, and adhere to Sorting at Source standards, guidelines, and regulations, creating a transparent and robust Waste management system aligned with Vision 2030 environmental goals.

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