



FIRE MANAGEMENT IN WASTE TREATMENT FACILITIES

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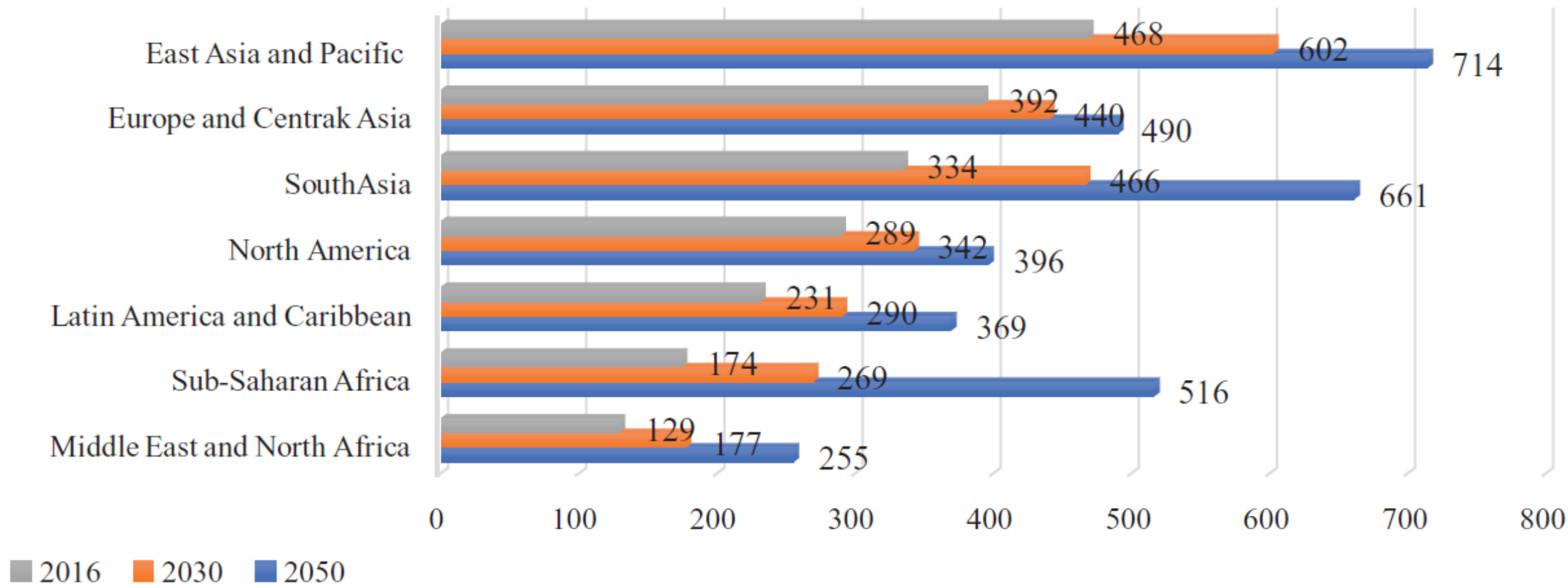


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Waste Generation (Million tonnes per year) (Source: Manjunatha et al., 2024)



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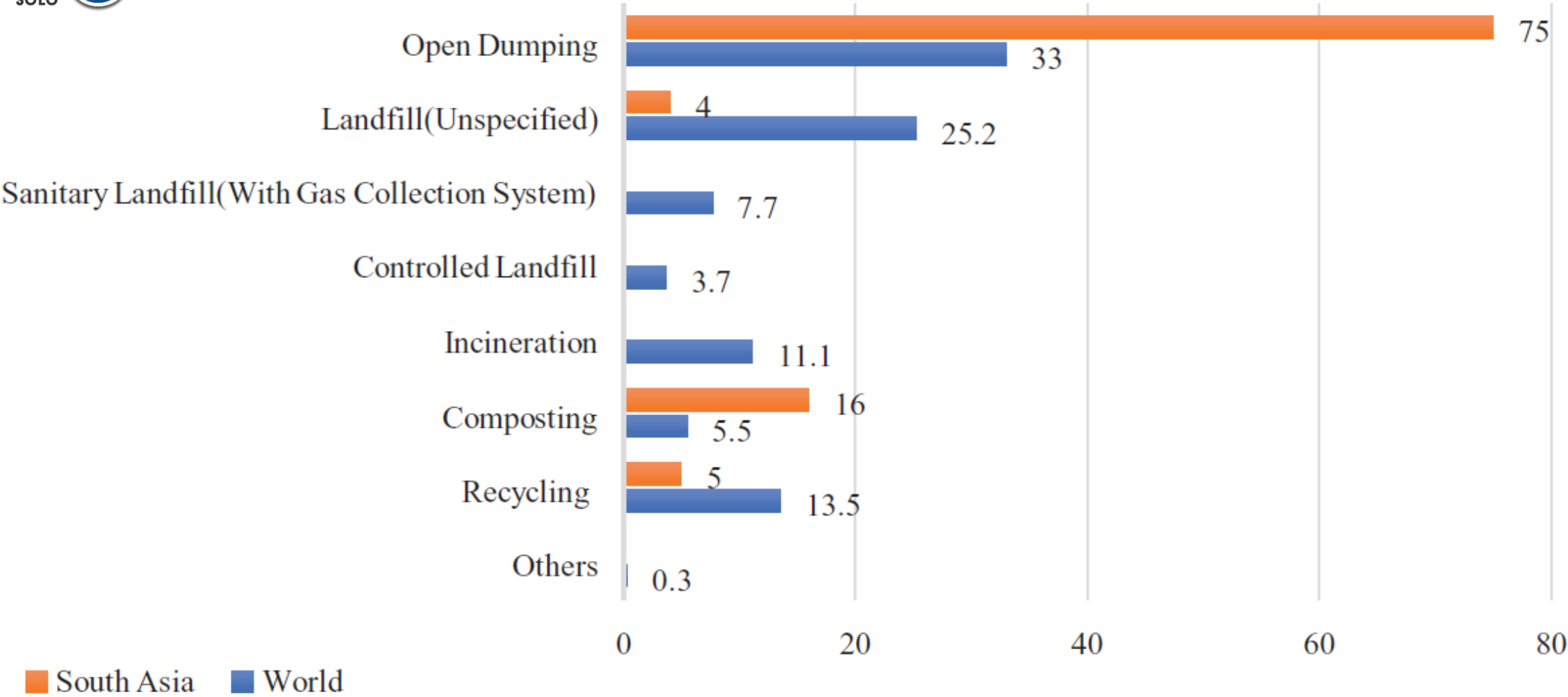


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Waste Disposal and Treatment (%), (Source: Manjunatha et al., 2024)



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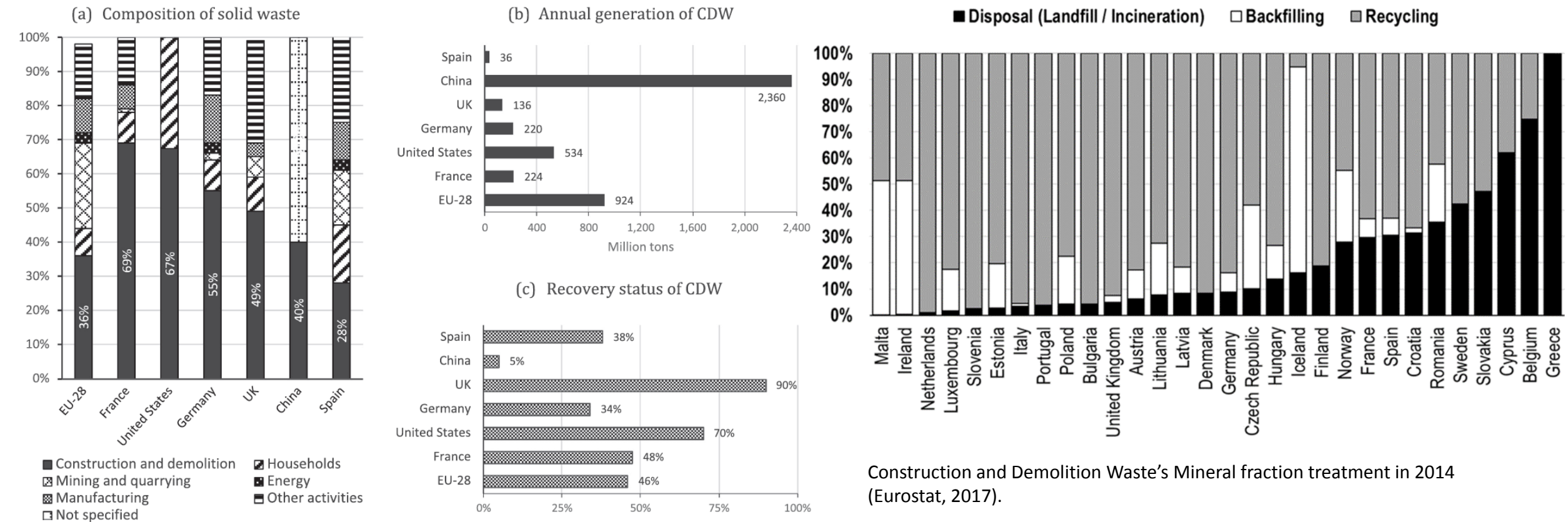
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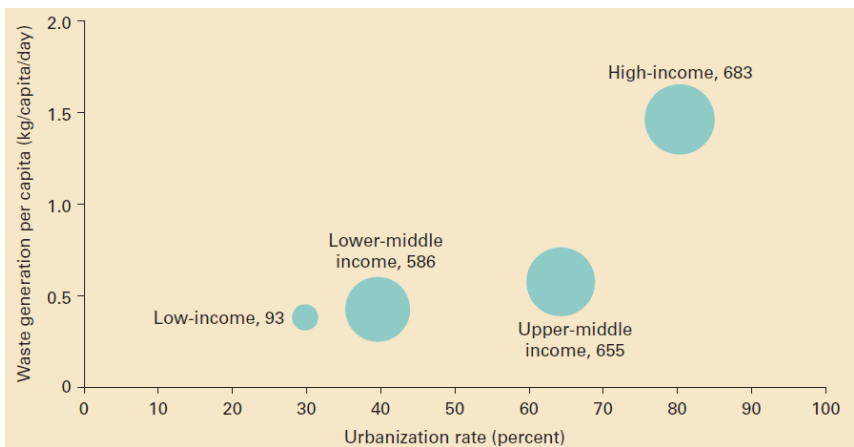
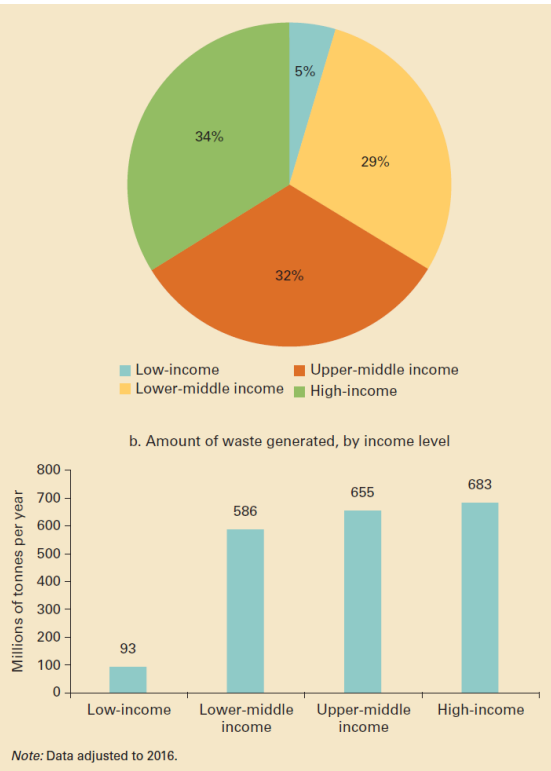
Comparison of generation and recovery status of CDW



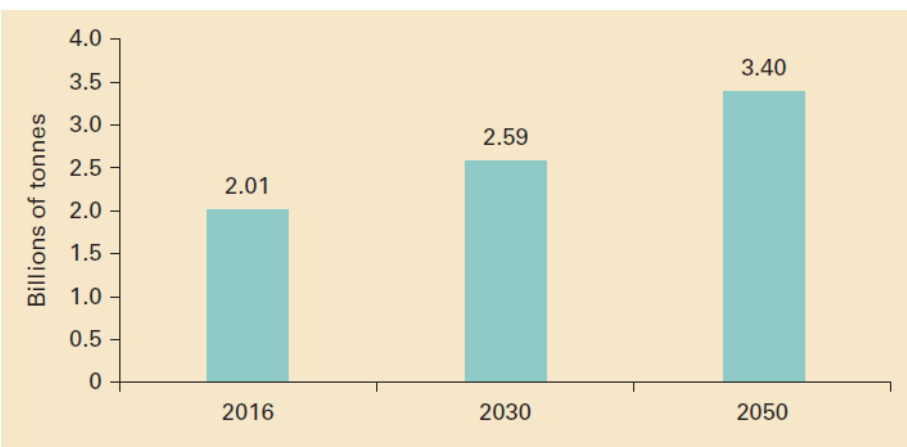
Construction and Demolition Waste's Mineral fraction treatment in 2014 (Eurostat, 2017).

(Source: Ruiz et al., 2020).

Global Waste Generation



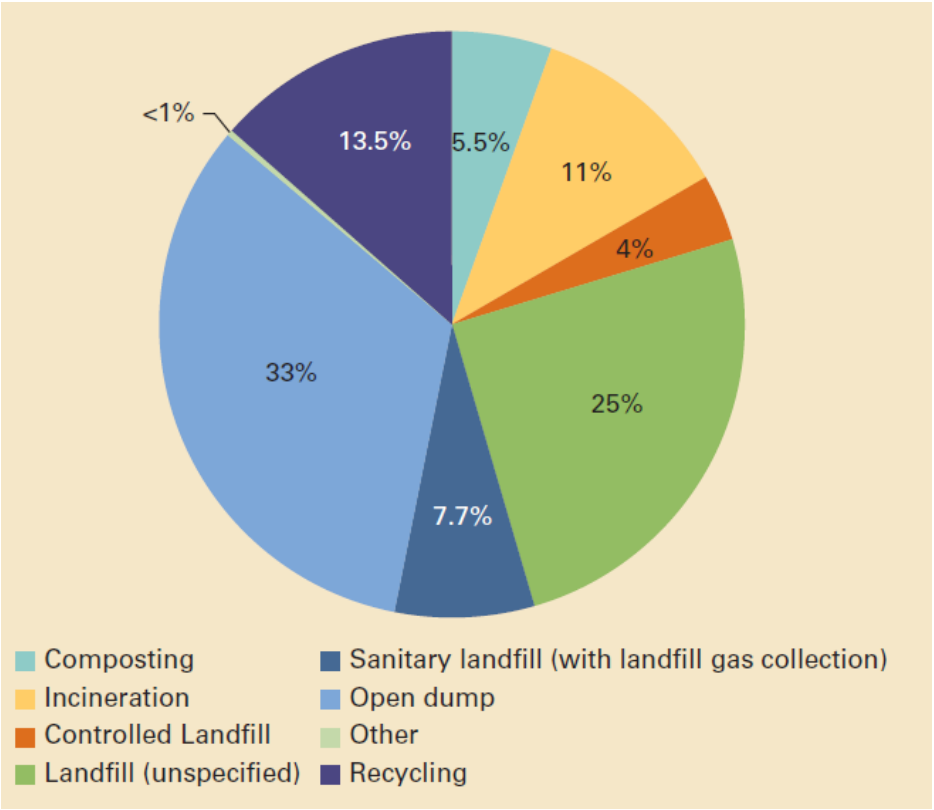
Waste Generation and Urbanization Rate by income group



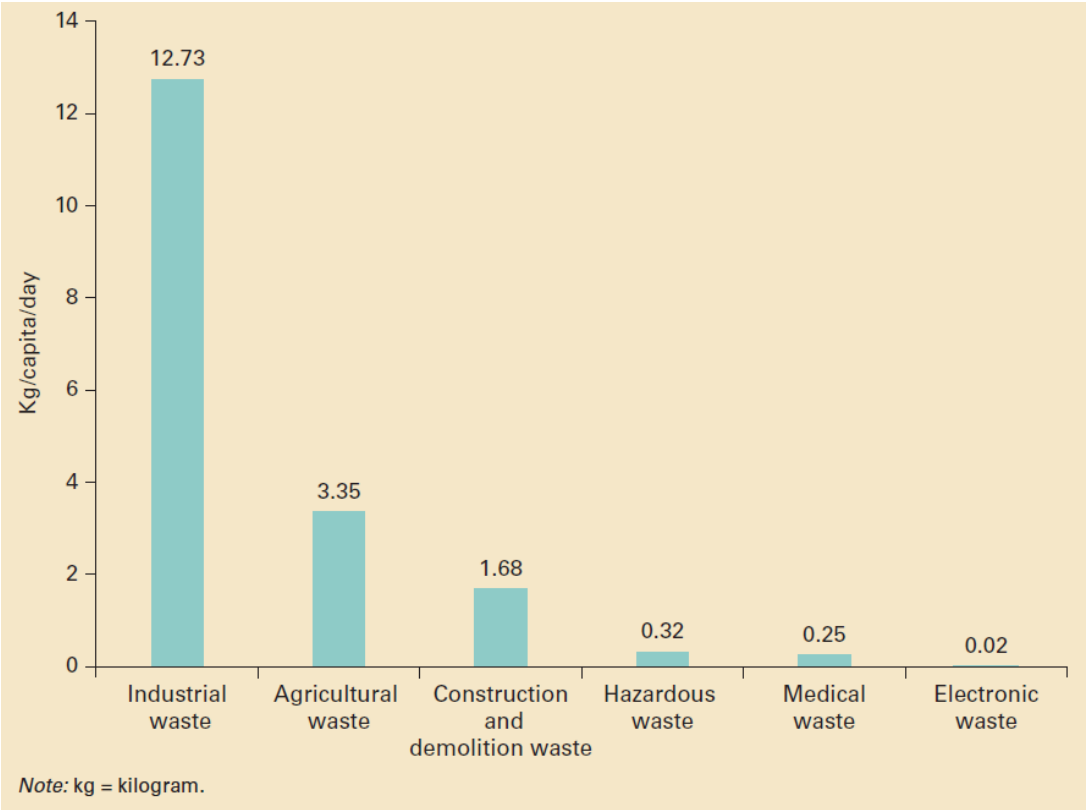
Projected Global Waste Generation

Waste Generation by Income Level
(Source: Kaza et al., 2018)

Global Waste Generation

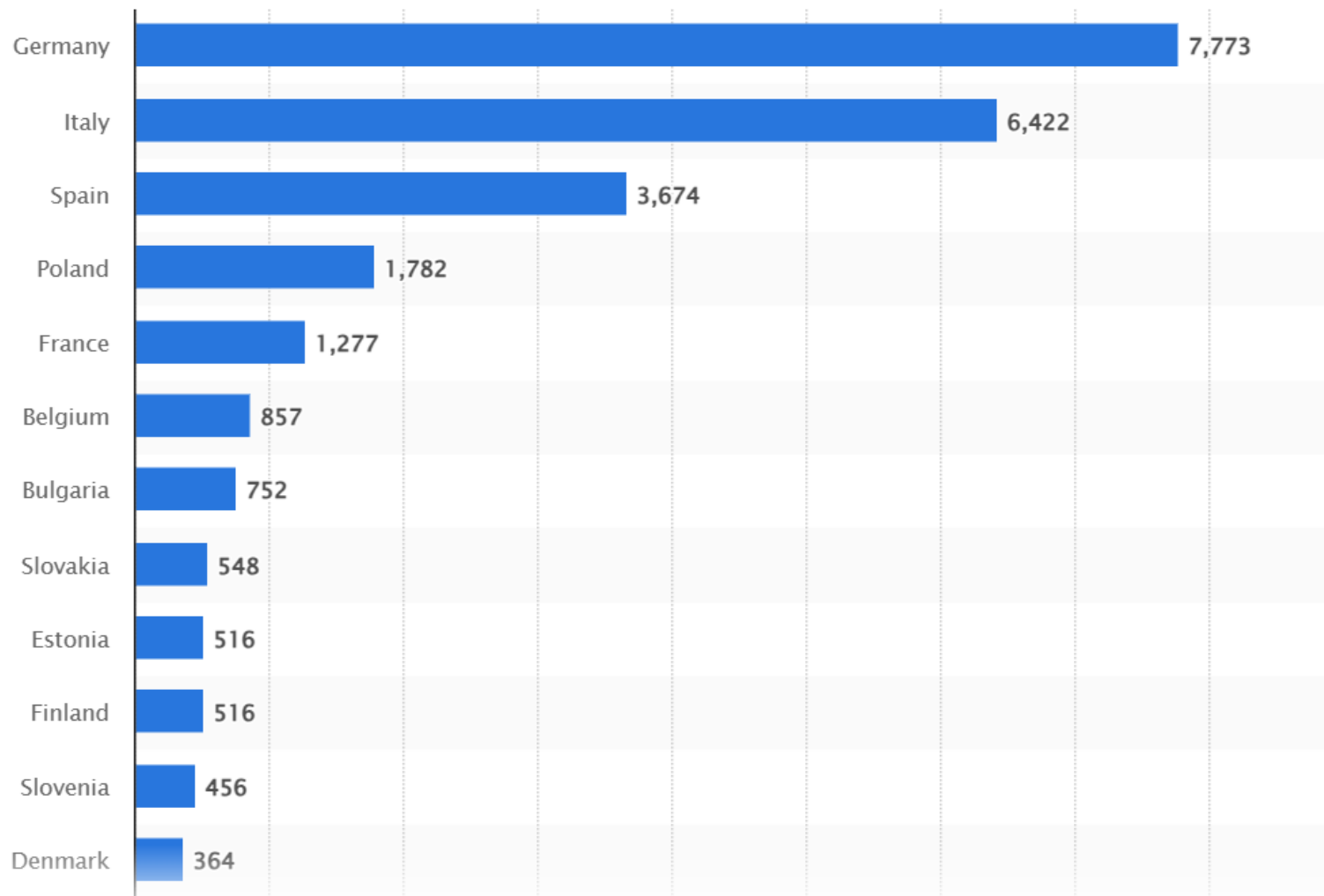


Global Waste Treatment and Disposal



Global Average Special Waste Generation

Number of recovery/recycling facilities in the European Union in 2020, by country





Fire Investigation

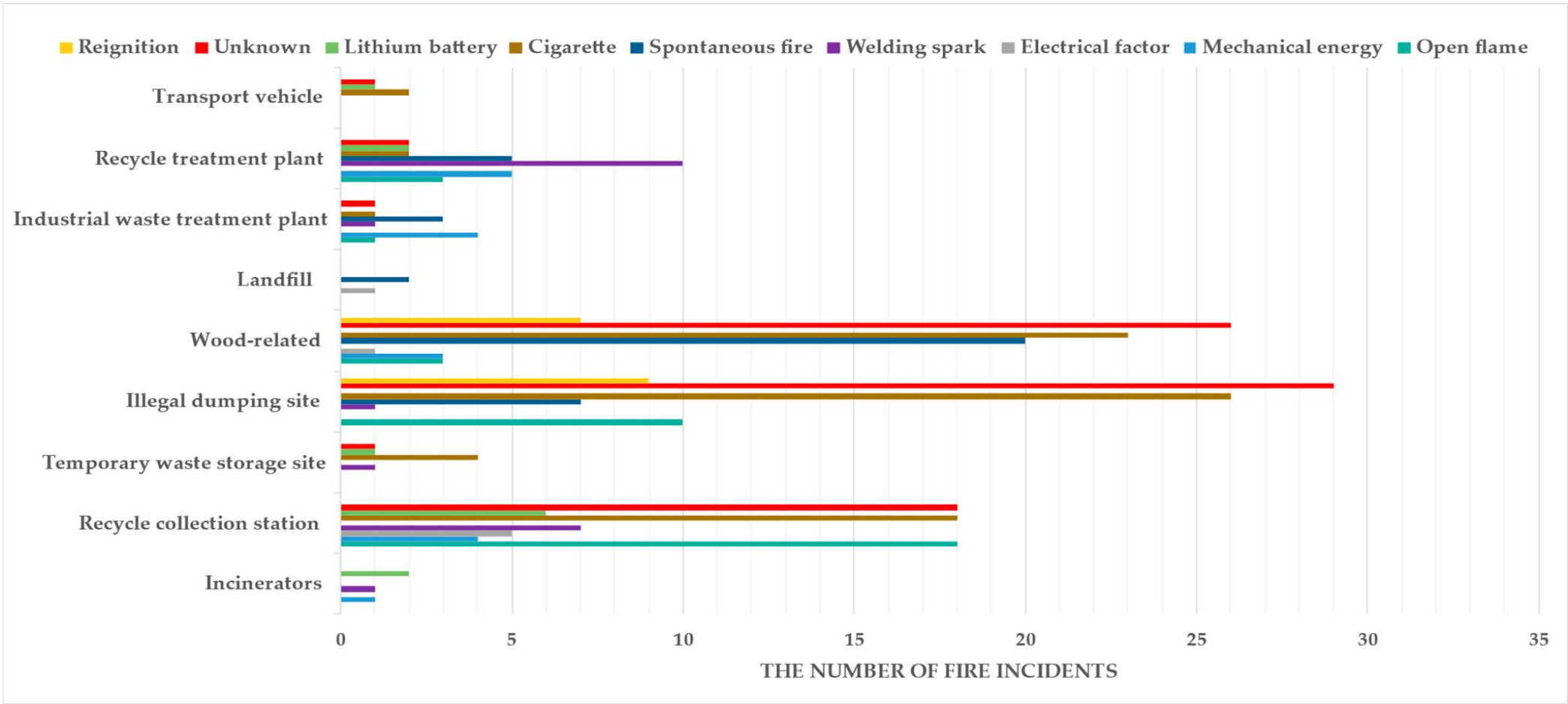
The data from the 299 waste-related fires were analyzed to provide a breakdown based on the type of facility from where the fire originated and the cause of the fire (Source: Juan et al., 2023).

Table 1. The distribution of cause of fires vs. types of waste disposal facility.

	Open Flame	Mechanical Energy	Electrical Factor	Welding Spark	Spontaneous Fire	Cigarette	Lithium Battery	Unknown	Re-Ignition
Incinerators	0	1	0	1	0	0	2	0	0
Recycle collection station	18	4	5	7	0	18	6	18	0
Temporary waste storage site	0	0	0	1	0	4	1	1	0
Illegal dumping site	10	0	0	1	7	26	0	29	9
Wood-related	3	3	1	0	20	23	0	26	7
Landfill	0	0	1	0	2	0	0	0	0
Industrial waste treatment plant	1	4	0	1	3	1	0	1	0
Recycle treatment plant	3	5	0	10	5	2	2	2	0
Transport vehicle	0	0	0	0	0	2	1	1	0



The distribution of cause of fires for different types of facility



(Source: Juan et al., 2023).



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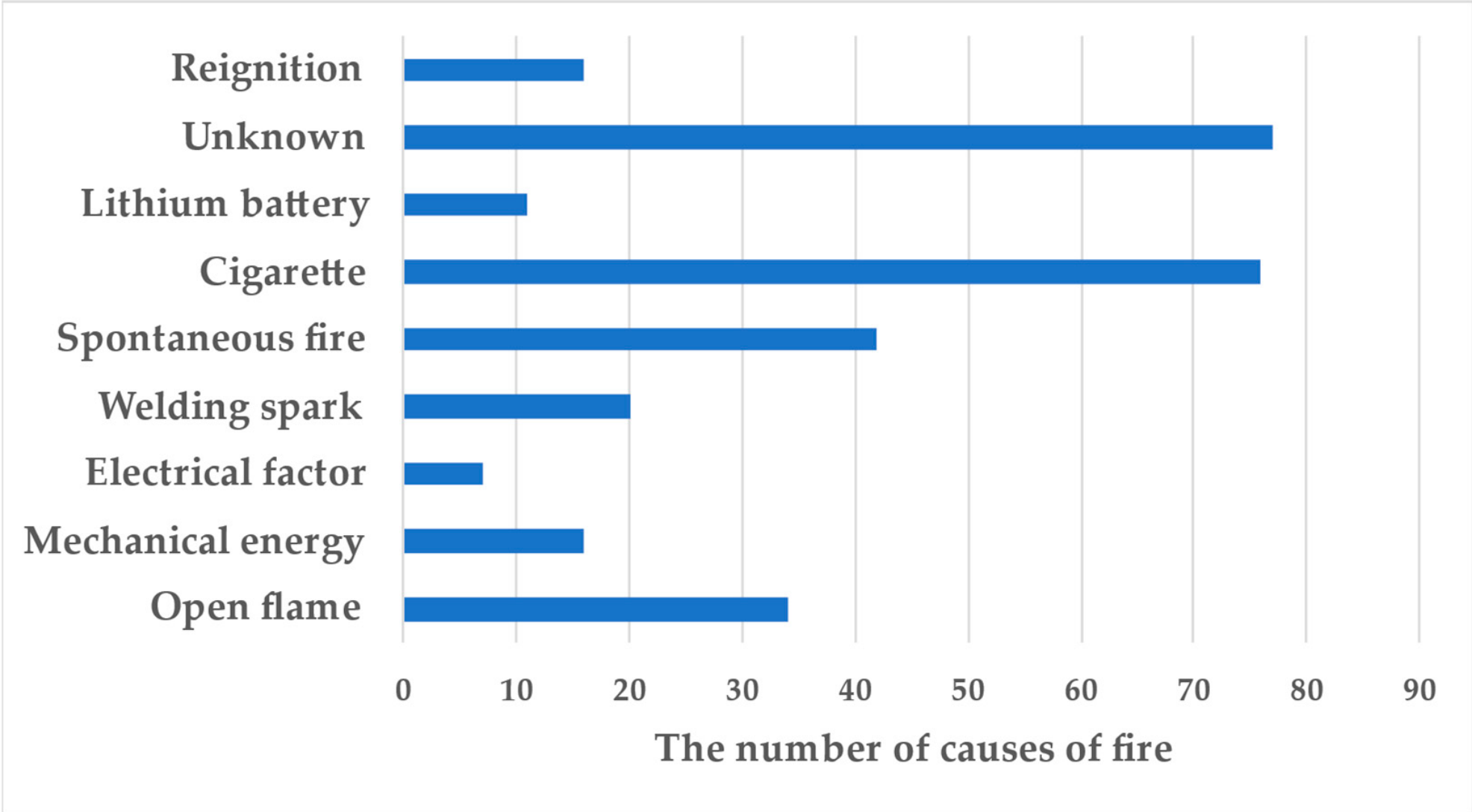
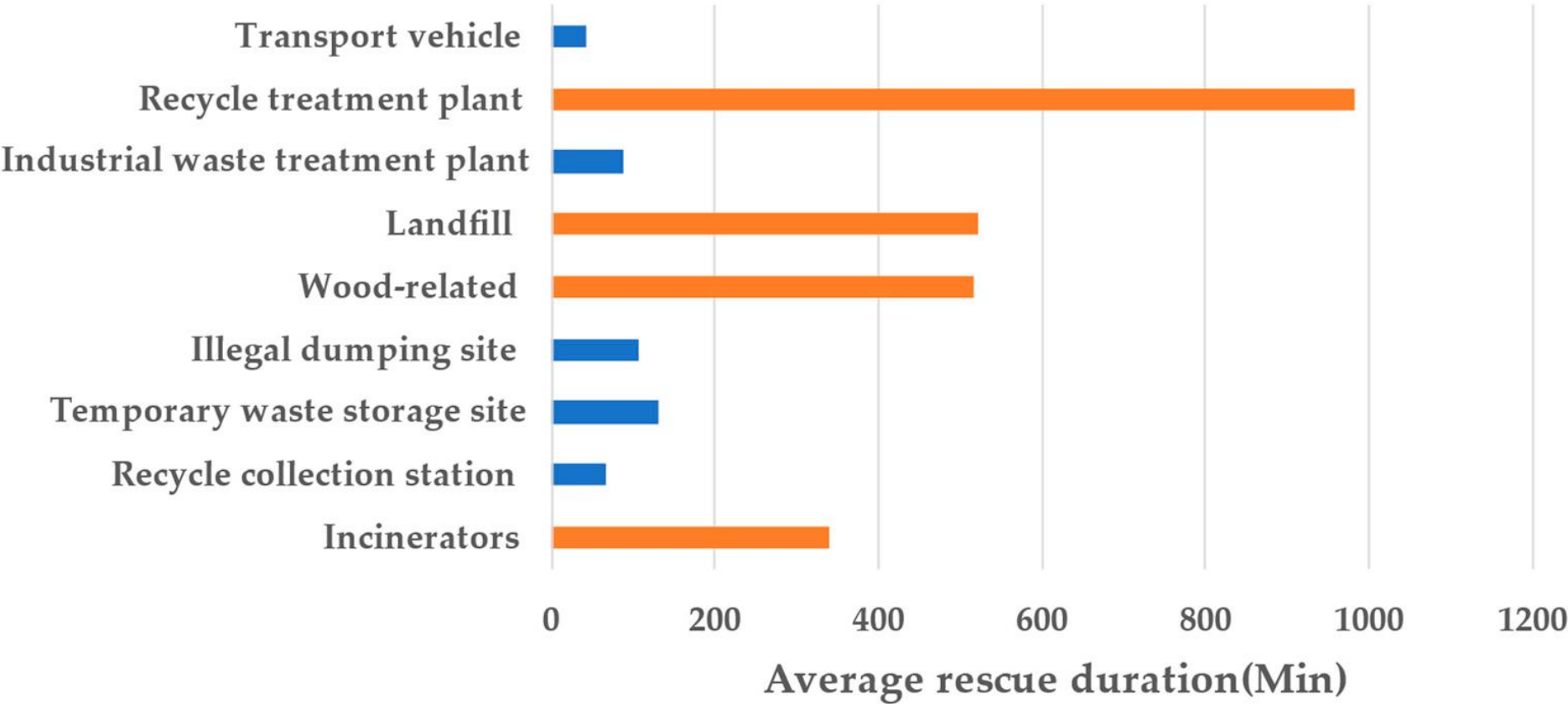
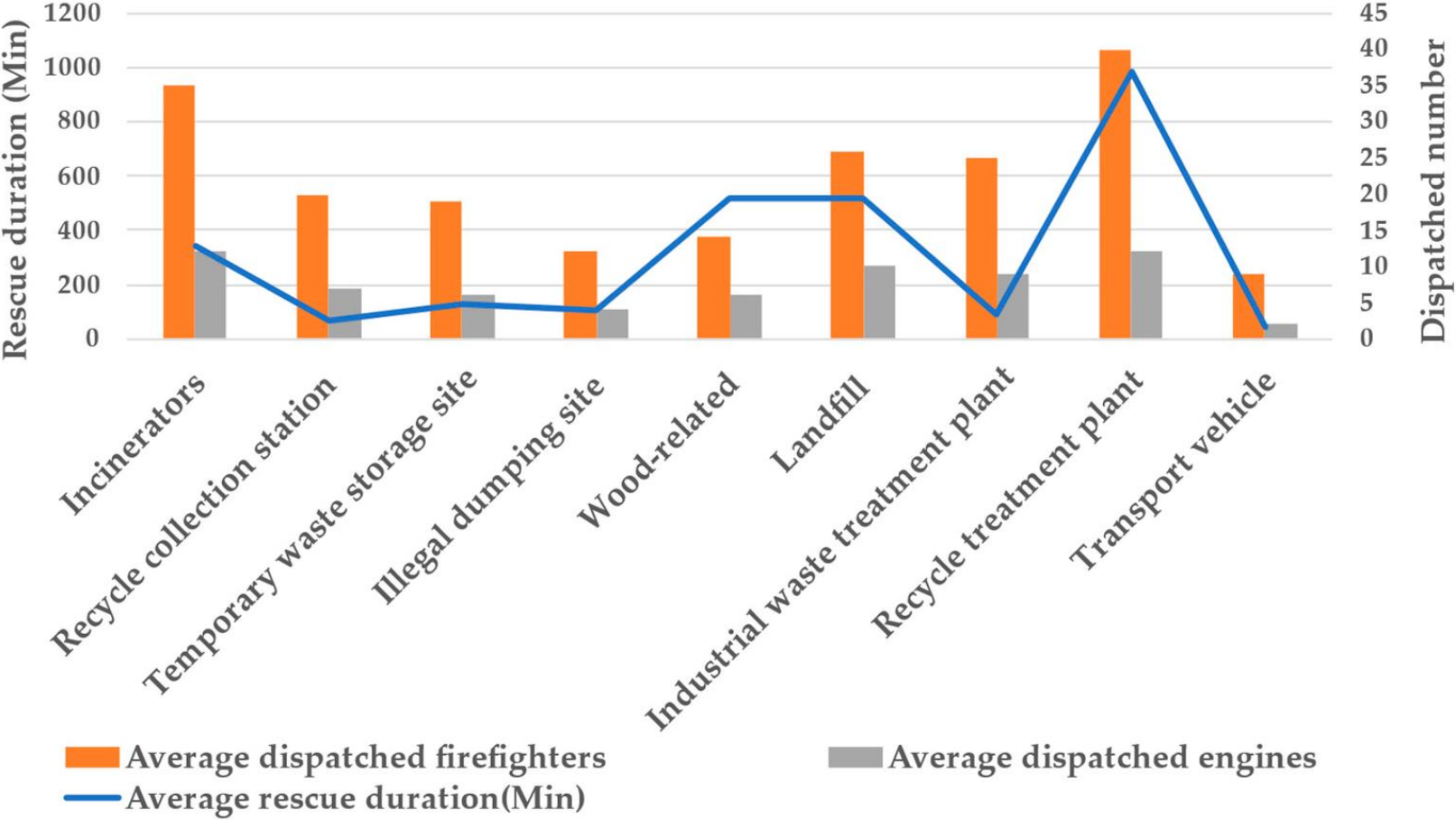


Figure provides statistics on the average time taken by firefighters to combat various types of waste treatment facility fires relating to the types of waste treatment facility fires whose rescue duration exceeds the total average of 310 min are marked in orange.



(Source: Juan et al., 2023).

Number of dispatched firefighters and engines compared with rescue duration.



(Source: Juan et al., 2023).

Fire risk assessment of waste treatment facilities

Level of Risk	Type of Facility	Frequency of Fire	Rescue Duration (Min)	Fire Risk	Hazard Characteristics
Very High	Illegal dumping site	Often	107	High	Large quantities Pollutants Deep-seated fire
	Wood-related	Often	517	High	Large quantities Deep-seated fire
High	Recycle treatment plant	Regularly	982	High	Large quantities Pollutants Damage on equipment
Moderate	Landfill	Very rarely	522	Moderate	Large quantities pollutants
	Incinerators *	Very rarely	339	Moderate	Large quantities
Low	Recycle collection station	Often	68	Moderate	Complex waste types Pollutants
	Temporary waste storage site	Rarely	130	Low	Complex waste types
Minimal	Industrial waste treatment plant	Rarely	88	Low	Large quantities Pollutants Damage on equipment
	Transport vehicle	Very rarely	43	Minimal	Moving object

* Waste collection area.

(Source: Mikalsen et al., 2021; Juan et al., 2023)



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Recommended safety measures: prevention, disaster reduction, disaster response,

Fields of Action	Strategic Steps	Measures
Design and construction of facilities and factories	Prevention	• Install adequate waste status monitoring equipment. • Ensure the load margin and protective measures of the power circuit. • Proper ventilation systems.
	Disaster reduction	• Ensure space for storage of waste. • Implement fire-resistant materials. • Install proper fire detection and suppression equipment * [29].
	Disaster response	• Proper escape route. • Proper space for emergency actions.
	Recovery	• Evaluate the structural properties of buildings and facilities. • Assess the adequacy of fire suppression and monitoring equipment. • Assess the adequacy of space for waste storage, emergency actions, and escape.

(Source: Mikalsen et al., 2021; Juan et al., 2023)



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Recommended safety measures: prevention, disaster reduction, disaster response, and recovery

Management organization and plan	Prevention	• Establish a dedicated management organization and program for fire safety. • Establish SOP for every step of operations. • Regular fire risk assessments.
	Disaster reduction	• Develop clear emergency action plans for fire incidents. • Plan for detection of fires, including manual monitoring. • Establish incident reporting and communication systems.
	Disaster response	• Provide ongoing training to staff on emergency response and evacuation protocols. • Regular fire drills. • Proper personal protection equipment ** [30].
	Recovery	• Documentation of case history, outcomes, and experience. • Re-assess fire management and response plans.

(Source: Mikalsen et al., 2021; Juan et al., 2023)



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Recommended safety measures: prevention, disaster reduction, disaster response, and recovery

Waste storage and treatment	Prevention	• Adequate storage plan, including how to classify and store different waste types. • Regular waste sampling and monitoring protocols. • Establish complete staff operating regulations and regular education and training.
	Disaster reduction	• Limit the size of waste stockpiles and storage time. • Plan fixed storage space for high-risk waste. • Ensure adequate space between waste stockpiles to limit fire spread and extinguish fire.
	Disaster response	• Adequate method or equipment of fire extinguishing. • Quick respondents and stop operations. • Ensure the protective equipment. • Evacuation and escape actions when the fire expands.
	Recovery	• Proper disposal of contaminated runoff water and fire-damaged waste. • Review and reallocation of the method and space of waste storage and classification.

(Source: Mikalsen et al., 2021; Juan et al., 2023)



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THANK YOU VERY MUCH
FOR
YOUR ATTENTION

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