YOUNG SMART CITIES

Co-funded by the European Union

Student Worksheet: Waste Management

Name	Class	Date

Big Question: How can cities prevent waste, keep materials in use, and manage the waste that remains safely and efficiently?

Waste management covers collection, transport, segregation, treatment, recovery, and final disposal. Sustainable systems aim to prevent waste first, then prepare items for reuse, recycle, recover value from remaining materials, and use disposal only as the least preferred option.

Lesson 1: From Waste to Resource

Activity 1: Waste Challenge Starter

Think about waste in your city. Choose the three biggest waste challenges it currently faces.

Waste priority		Waste priority	
Not enough waste or recycling bins in public areas		Too much single-use packaging	
Recycling system is confusing or poorly implemented		Few places to repair old devices or products	
Too much food waste		Broken electronics are difficult to dispose of properly	
Litter in streets, parks or public spaces		Other	

My/our top waste priority is: _____

Outline why it matters:

_____

_____

_____

Activity 2: Match the Waste Hierarchy

Match each waste action to the correct level of the Waste Management Hierarchy.

Hierarchy level	Action
1. Prevent	A. Turn used materials into new products
2. Prepare for reuse	B. Send waste that cannot be recovered to final disposal
3. Recycle	C. Avoid creating unnecessary waste in the first place
4. Other recovery	D. Repair, clean or prepare an item so it can be used again
5. Dispose	E. Recover value from waste in another way, such as energy recovery

Answers: 1 = ___ 2 = ___ 3 = ___ 4 = ___ 5 = ___

Which level should cities prioritise most, and why?

_____

_____

_____

Activity 3: Waste City Vocabulary

Match each term to the correct definition.

Term	Definition
1. Waste hierarchy	A. An approach where materials stay in productive use for longer.
2. Segregation	B. Converting residual waste into useful energy such as heat, electricity, or biofuels.
3. Circular economy	C. Using technologies such as sensor-equipped bins and data platforms to improve efficiency and transparency.
4. Waste-to-energy	D. A ranking from prevention and reuse through recycling and recovery to disposal.
5. Smart waste management	E. Separating waste into categories such as recyclables, organics, and hazardous materials.

Answers: 1 = ___ 2 = ___ 3 = ___ 4 = ___ 5 = ___

Activity 4: Who Shapes the Waste Stream?

Choose one waste problem. Explain how different groups can influence prevention, reuse, recycling, recovery, or disposal.

Stakeholder	Possible role
City government	
Producers	
Retailers	
Waste operators	
Households / consumers	
Local businesses	

Most important shared responsibility you have observed:

_____

_____

_____

Lesson 2: Design a Better Waste System

Activity 5: Waste Solution Lab

Choose one challenge for your team.

Challenge	Tick
Reduce litter in public spaces	
Make recycling easier to use	
Reduce food waste	
Help people repair or reuse old items	
Improve access to waste and recycling bins	
Stop reusable items being thrown away	
Improve collection of different waste types	
Other: _____	

Activity 6: Build Your Waste Idea

Which system elements will you use? Tick all that apply.

Tool	Tick	Tool	Tick
Add more recycling and waste bins		Use data to improve collection routes	
Introduce repair or reuse schemes		Work with producers to reduce single-use packaging	
Improve separate collection of waste		Use sensors/data to improve waste collection routes	
Provide composting devices for homes		Set local rules or incentives to reduce waste	

Give a brief outline of how your solution works from generation to treatment:

_____

_____

_____

Identify which step of the waste hierarchy is prioritised:

_____

_____

_____

Outline how your idea protects health, resources, or the environment:

_____

_____

_____

Identify which stakeholders need to take part:

_____

_____

_____

Check at least two questions your system needs to address.

Consideration	Tick	Consideration	Tick
Will local people use and support it?		How will it be maintained over time?	
Does it suit local waste habits and needs?		Can smart data improve collection?	
Could anyone be disadvantaged?		Will local authority support be needed?	
Is it cost-effective to introduce?		Other: _____	

Explain how you will improve the system based on these questions:

_____

_____

_____

Activity 7: Draw Your Prototype

Draw your waste system. Show where waste is generated, how it is collected and separated, what is reused/recycled/treated, where smart technology helps, and what happens to residual waste.

Activity 8: 60-Second Pitch

Prepare a 60-second pitch for your idea by addressing each of these 6 steps:

Starter	Notes
1. The waste problem is	
2. Our solution is	
3. It follows the waste hierarchy by	
4. Technology/data helps by	
5. It protects resources or health because	
6. One system question we tested was	

Activity 9: Peer Review

Ask your peers for feedback on your pitch, addressing these 4 steps:

Question	Feedback
Strongest part of the waste idea	
Which hierarchy step is prioritised?	
How are materials kept in use?	
One improvement suggestion	

Exit Ticket

Complete these sentences to show what you understand about waste management in cities.

Sentence starter	Complete the sentence
The waste hierarchy starts with	
Segregation is important because	
Waste-to-energy is used for	
My favourite waste solution from today was	

Teacher Notes

Learning objectives

- Describe the main stages of an urban waste management system.
- Use the waste hierarchy to rank prevention, reuse, recycling, recovery, and disposal.
- Explain how smart technologies can improve collection and monitoring.
- Design a waste solution that keeps materials in use and minimises final disposal.
- Explain or ask students to read the YSC Knowledge Pill: https://youngsmartcities.com/learn/waste-management-in-cities/

Suggested timing

Lesson	Timing
Lesson 1	10 min Activity 1 | 20 min Activity 2 | 10 min Activity 3 | 15 min Activity 4
Lesson 2	10 min Activity 5 | 20 min Activity 6 | 15 min Activity 7 | 15-20 min Activities 8-9 | 5 min Exit Ticket

Differentiation

Younger students: focus on the waste hierarchy and familiar household waste. Older students: ask students to justify why prevention and reuse rank above recycling, explain when waste-to-energy applies, and adapt their system to different local waste compositions.