In **disaster management**, calculating the **volume** and **surface area** of containers, tanks, and shelters is important for managing **storage**, **transport**, and **distribution** of **water**, **food**, **supplies**, and **space**. Understanding the **geometry of 3D shapes** like **cubes**, **cuboids**, and **cylinders** helps responders make informed decisions quickly.

🔷 1. Volume of a Cube

🔷 Formula:

$$V = a^3 \quad (\text{where } a = \text{side length})$$

✅ Example:

An emergency box is shaped like a cube with sides **1.2 meters**.

$$V = (1.2)^3 = 1.728\,\text{m}^3$$

➡️ The box can store **1.728 cubic meters** of supplies such as food or blankets.

🔷 2. Volume of a Cuboid

🔷 Formula:

$$V = l \times w \times h$$

✅ Example:

A temporary storage room measures **4 m × 3 m × 2.5 m**

$$V = 4 \times 3 \times 2.5 = 30\,\text{m}^3$$

➡️ The storage room holds **30 cubic meters** of aid supplies.

🔷 3. Volume of a Cylinder

🔷 Formula:

$$V = \pi r^2 h$$

✅ Example:

A water tank is **cylindrical**, with radius **0.5 m** and height **2 m**.

$$V = \pi(0.5)^2 \times 2 = \pi \times 0.25 \times 2 = 0.5\pi \approx 1.57\,\text{m}^3$$

➡️ The tank holds approximately **1.57 m³** or **1,570 liters** of water (since 1 m³ = 1,000 L).

🔷 4. Total Surface Area of a Cube

🔹 Formula:

$$TSA = 6a^2$$

✅ Example:

A sanitation box has a side length of **0.8 meters**.

$$TSA = 6 \times (0.8)^2 = 6 \times 0.64 = 3.84\,\text{m}^2$$

➡️ The cube has a **surface area of 3.84 m²** — important for painting or disinfecting.

🔷 5. Total Surface Area of a Cylinder

🔹 Formula:

$$TSA = 2\pi r(h + r)$$

✅ Example:

A large barrel has a **radius of 0.4 m** and **height of 1.5 m**.

$$TSA = 2\pi(0.4)(1.5 + 0.4) = 2\pi(0.4)(1.9) \approx 4.77\,\text{m}^2$$

➡️ The surface area is about **4.77 m²**, useful for insulation or coating.

✅ Summary Table:

Shape	Formula	Example Dimensions	Result	Use
Cube (Volume)	a^3	a = 1.2 m	1.728 m^3	Supply storage
Cuboid (Volume)	$l \times w \times h$	4×3×2.5 m	30 m^3	Warehouse capacity
Cylinder (Volume)	$\pi r^2 h$	r = 0.5 m, h = 2 m	1.57 m^3	Water tank volume
Cube (Surface Area)	$6a^2$	a = 0.8 m	3.84 m^2	Coating sanitation boxes
Cylinder (Surface Area)	$2\pi r(h + r)$	r = 0.4 m, h = 1.5 m	4.77 m^2	Painting or insulation

🧠 Why This Is Useful in Disaster Management:

- ✅ Accurately estimate **space needed** for storing relief supplies
- ✅ Calculate **tank sizes** for clean water and fuel
- ✅ Determine **material use** for wrapping, painting, or insulating containers
- ✅ Improve **logistics** for packaging and transport