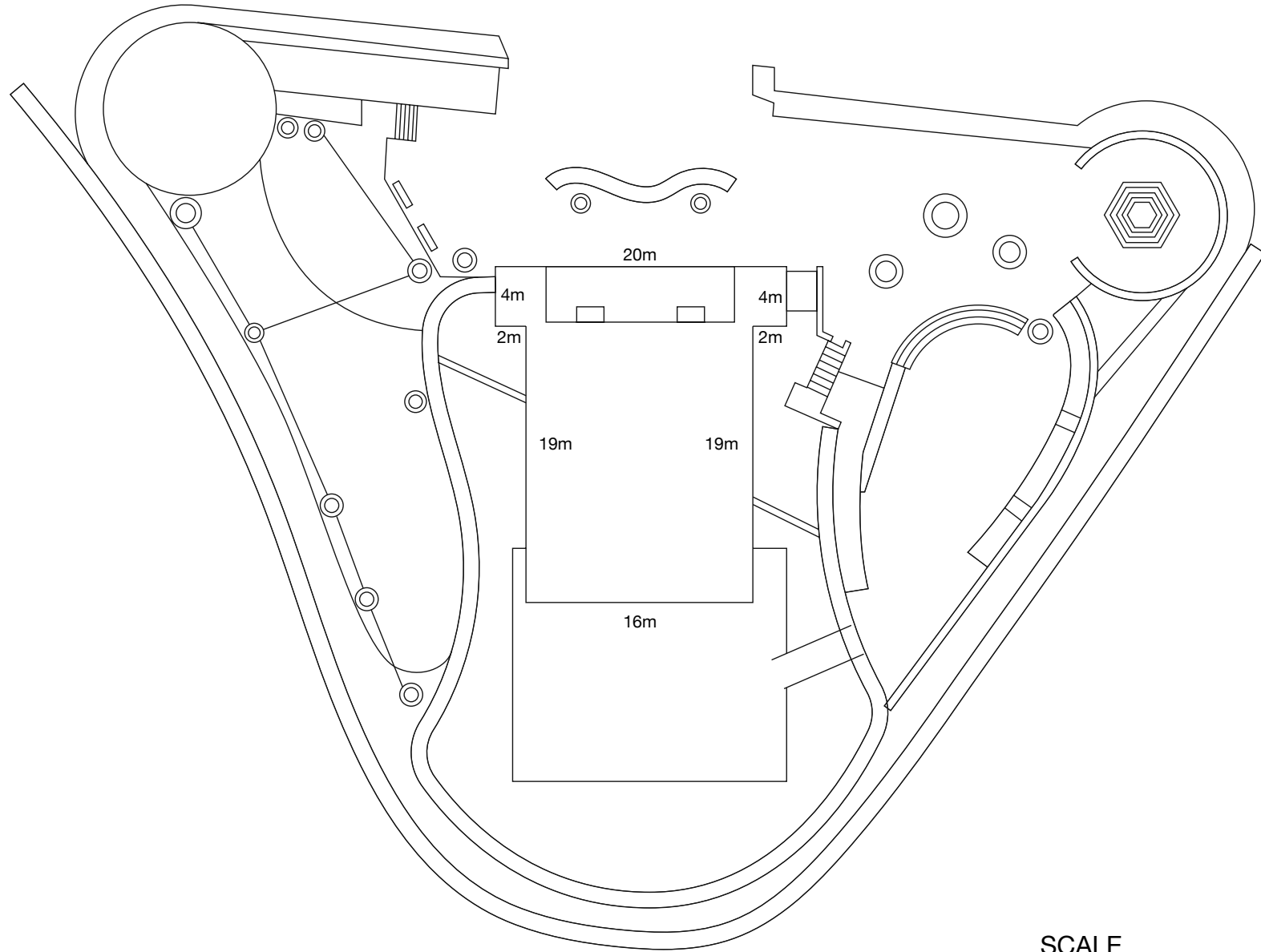


# The Għajn Hero

**GAMES BOOKLET**  
Play & Learn

# The Ghajn Centre



SCALE  
(0-10M)

If you are a class, split into six groups to explore the different sustainability practices at the Ghajn Centre.



## Rain collectors

Go to page 4



## Water use explorers

Go to page 6

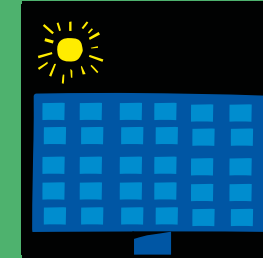


## Garden experts

Go to page 7



This symbol indicates that the activity is for an advanced level or for older students!



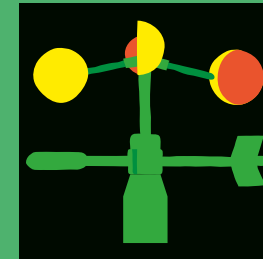
## Energy investigators

Go to page 8



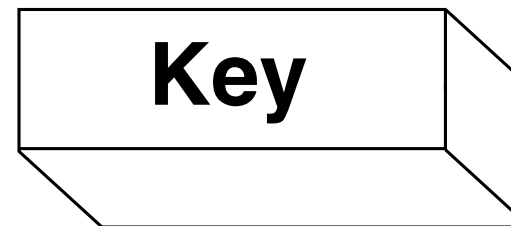
## Waste auditors

Go to page 12



## Meteorologists

Go to page 10






- Permeable surface (lets the water percolate)
- Permeable surface (the water flows over it)
- Collection surface for the rainwater reservoir
- Waste bin No 1, 2, etc.
- Recycling bin No 1, 2, etc.
- A litter item that risks ending up in the sea

# The rain collectors

1. Explore the rainwater harvesting system at Ghajn. Choose the right answer.

- I. The rainwater reservoir at Ghajn is located under:  
**a) the playground      b) the terrace in front of the main building**  
**c) the weather station      d) the mini theatre and exhibition area**
- II. The rainwater reservoir has a capacity of:  
**a) 5 m<sup>3</sup>      b) 50 m<sup>3</sup>      c) 500 m<sup>3</sup>      d) 5,000 m<sup>3</sup>**
- III. Find out what the current status of the reservoir is:  
**a) totally empty      b) almost empty      b) half-filled      c) full or almost full**
- IV. How is the collected rainwater used at the Centre?  
**a) for watering the garden      b) for toilet flushing**  
**c) for cleaning      d) for drinking**
- V) What are the advantages of collecting the rainwater?  
**a) less consumption from the network      b) cheaper water bill**  
**c) reduced risk of floods      d) all of the above**

2. Review the diagram on page 2. Sketch the three surfaces that behave differently with water according to the following key.

-  Surface that lets the water percolate (permeable surface)
-  Surface that water flows over (impermeable surface)
-  Collection surface for the rainwater that goes into the reservoir



3. How big is the surface of the roof of the Centre? Review scale of the diagram of page 2 and calculate the collection surface in m<sup>2</sup>.

.....

.....

.....



4. How much water is collected in a day when there is a rainfall of 12 mm? Do the calculation!

.....

.....

.....

If you know the area of the collection surface (m<sup>2</sup>) and the rainfall height (mm), you can calculate the volume of rainwater collected with the following formula:

$$V = \frac{A \times R}{1000}$$

**V:** Volume of the harvested rain (m<sup>3</sup>)  
**A:** Area of the collection surface (m<sup>2</sup>)  
**R:** Rainfall (mm)

# The water use explorers

1. Inspect the toilet flushings of Ghajn. **Choose the correct answer and fill in the table.**

	YES	NO
I. Do the flushings operate on a dual function (full and half)?		
II. What is the volume of the flush tank?	Full: ..... Litres	Half: ..... Litres
III. If the flush valves are pressed 30 times a day how much water do the toilets consume?	Full: ..... Litres	Half: ..... Litres
IV. Propose a way to economise flush water at home:	.....	

2. Inspect the water taps in the Ghajn toilets. **Choose the correct answer and fill in the table.**

	a) aeration c) timed dose	b) movement sensor d) aeration & timed dose
I. What water saving systems are in place?		
II. Using a volumetric container, measure the water consumed with one press:	..... Millilitres	Or ..... Litres
III. If the taps are pressed 30 times a day, how much water is consumed in a day?	..... Millilitres	Or ..... Litres
IV. Propose a way to save on tap water use at home:	.....	

3. **Choose the right answer.**

I. Out of all the water used in an apartment, how much of this water goes for laundry purposes and toilet flushings (this water doesn't have to be potable, i.e. of excellent quality)?

- a) around 15%      b) around 30%      c) around 50%      d) around 80%

II. The wastewater that results from washing our face and hands or showering can be reused in the toilet or garden after a simple treatment process. This water is called:

- a) grey water      b) black water      c) red water      d) blue water

III. How much water is lost every 24 hours from a tap that leaks one drop per second? (Note: 20 drops= 1 ml)

- a) 0.43 Lt      b) 4.3 Litres      c) 43 Litres      d) 430 Litres



## The garden experts

1. How is the green space of the Ghajn Centre watered? **Choose the right answer.**

- a) by drip irrigation      b) by a sprinkler  
c) with a hose      d) with a watering can

2. Study the vegetation of the Ghajn Centre. **Answer the following.**

- I. Count the total number of trees within the Centre .....
- II. Name a plant or tree that does not need a lot of water .....
- III. What is the air temperature at a) the weather station ..... °C and b) a shady area under a tree ..... °C. Explain why they may differ .....

3. **The leaf assignment:** Choose a leaf from any plant. Don't cut it; observe it carefully.

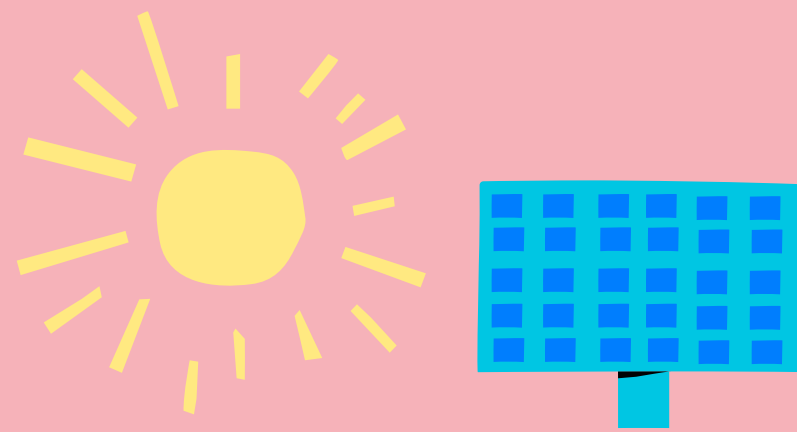
**Draw the leaf**

What does the shape of the leaf tell you about the water needs of the plant?

.....

.....

# The energy investigators



## 1. Choose the right answer.

I. Some forms of energy are called 'renewable' because they:

- a) do not pollute
- b) are brand new
- c) can be naturally replenished in a short time
- d) consume more carbon

II. Photovoltaic (PV) or solar panels harness the sun's rays to generate:

- a) electricity
- b) hot water
- c) light inside a building
- d) clean air indoors

III. A PV panel is composed of many small PV cells, like those used in calculators, watches, solar lights, etc.

- a) True
- b) False

IV. A device is 'energy efficient' when:

- a) it is faster than another similar one
- b) it gives more light than another similar one
- c) it uses energy only from renewable sources
- d) it uses less energy than similar devices

V. Energy efficiency is practiced in the Ghajn Centre by using:

- a) double glazed glass
- b) light dimmers
- c) PV panels on the roof
- d) all of the above

VI. Power consumption is measured in kilowatt hours (kWh). One kWh is the amount of energy consumed when an appliance of 1,000 watts operates for:

- a) one minute
- b) one hour
- c) one thousand hours
- d) one day



VII. Ghajn's PV panels have a peak power of 8.7 kWh, which means that when it is sunny, after one hour they will produce 8.7 kWh. This is enough electricity for a microwave of 1000 Watt to operate for:

- a) 0.87 hours
- b) 8.7 hours
- c) 87 hours
- d) 870 hours

## 2. Study the Water and Energy bill and answer the following questions.

**WATER & ENERGY MANAGEMENT SERVICES OF MALTA**

www.wema.mt  
8071111 Help line

Period: 22 Dec 2018 – 19 Feb 2019  
Total No. of days: 60

Total due: € 80.18  
Payable by: 09 May 2019

GHAJN HERO  
APT 2. TRIQ IS-SAQWI  
H'ATTARD, MALTA

No. of residents: 1  
Consumer Scheme: Residential

Your consumption summary:

⚡ Electricity	
Service charge	10.51
Consumption	53.15
Less Eco-reduction	0.0
<b>Subtotal</b>	<b>63.66</b>

💧 Water	
Service charge	9.54
Consumption	6.98
<b>Subtotal</b>	<b>16.52</b>

Total for this period: **80.18**

Meter readings:

⚡ Electricity	
Readings	Consumption
PREVIOUS=> CURRENT	
16179 => 16659	480 kWh

💧 Water	
Readings	Consumption
PREVIOUS=> CURRENT	
336 => 341	5 m <sup>3</sup>

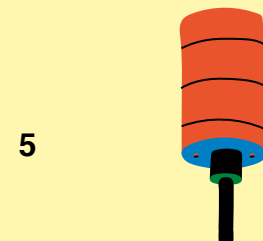
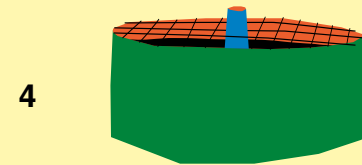
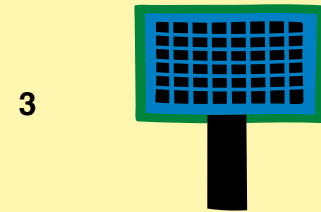
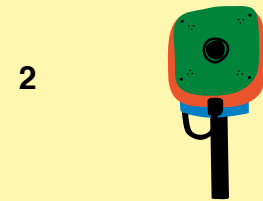
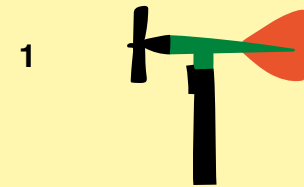
- I. According to the above bill, how many persons live in this household?.....
- II. How many days of consumption does the bill cover?.....
- III. How many kWh of electricity were consumed in the household in this period?.....
- IV. What is the mean electricity consumption of the household per day?.....
- V. How many cubic meters of water were consumed in the household in this period?.....
- VI. What is the mean water consumption of the household per day?.....
- VII. Will the electricity produced in a day by the PV panels of Ghajn be enough for the daily needs of the above household?.....

TIP! Ghajn's PV panels have a peak power 8.7 kWh, so in ideal conditions, after 6 hours of full sunshine they will produce  $6 \times 8.7 = 52.2$  kWh. The actual electricity produced in a day is about 20% lower due to weather conditions and losses in the system. So, the actual mean daily electricity production of Ghajn is  $52.2 \times 0.8 = 41.76$  kWh.

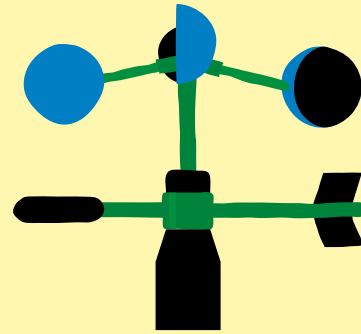
# The meteorologists

1. What type of information does the weather station of Ghajn record?  
Do the matching.

## Instrument



10



## Measures

A. ... is there to charge all the equipment of the weather station (Solar Panel).

B. ... the amount of water that evaporates into the atmosphere over a specified time (Evaporation Pan).

C. ... atmospheric pressure (Barometer).

D. ... the amount of the precipitating rain (Rain gauge).

E. ... the direction and the speed of the wind (Anemometer).

Answers: 1 ..., 2 ..., 3 ..., 4 ..., 5 ...

2. With the help of the weather station's floor compass, find out what the wind's direction is now.  
Fill in the blanks:

Date: ..... Time: ..... The wind right now is blowing from the ..... direction.



North (N)

North-East (NE)

East (E)

South-East (SE)

South (S)

South-West (SW)

West (W)

North-West (NW)

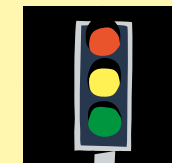
3. Visit the website [malta.smartyplanet.com](http://malta.smartyplanet.com) and find out the real time measurement of:

A) Temperature: ..... °C

B) Humidity: ..... %

C) Wind: ..... Bf from ..... direction

D) Atmospheric Pressure: ..... hPa






4. How do we know that it is going to rain?

.....  
 .....  
 .....

# The waste auditors

1. Observe where the waste and recycling bins are, inside and outside the Ghajn Centre. Mark and number the bins on the plan of page 2.

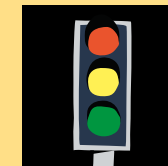
2. Fill in the table below.

Bin number	The bin is for ... (which material)	Condition			My comment on what needs to be improved.
		 poor	 average	 good	

3. Look around and find a litter item, which, if not collected, might reach the sea when it rains again. Draw the item in the box and mark an L on page 2 to indicate the spot where you found it.

4. What about you? Will you create any waste during your visit at Ghajn? Open your lunch pack and take note of any wrappers and leftovers that you will dispose of before you leave the Centre. Could you avoid it next time you prepare your lunch pack? Complete the phrases below:

Before I leave Ghajn I expect to leave behind as waste ...	In order to avoid it, next time I can ...



5. Test your knowledge in composting! When we compost, every 100 kilos of organic waste generates 15 kilos of earth. Where do the remaining 85 kilos go?

My answer .....

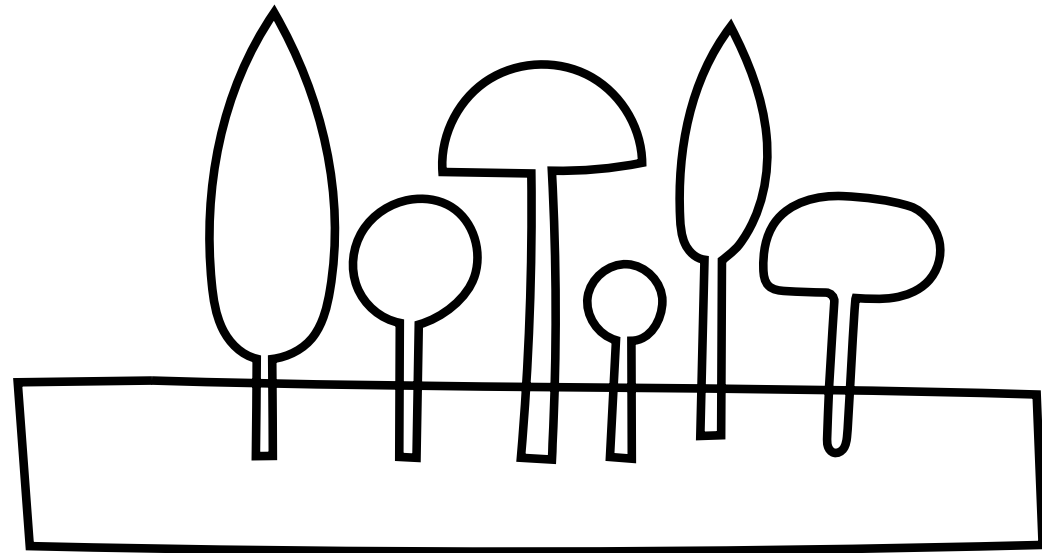
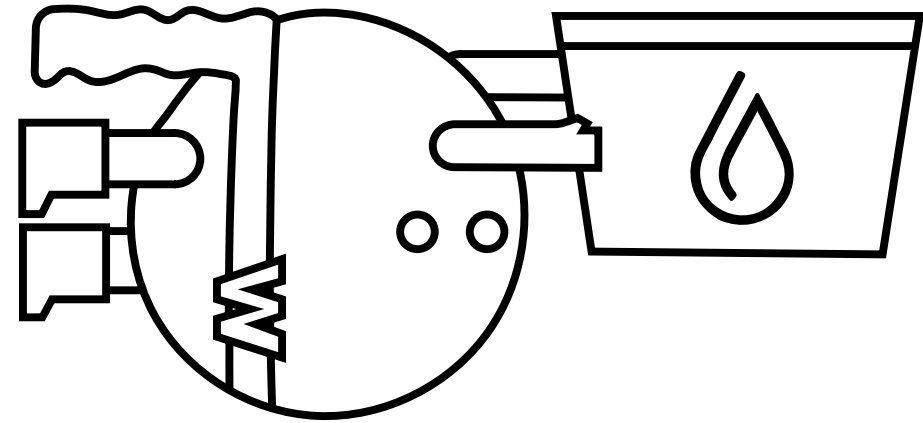
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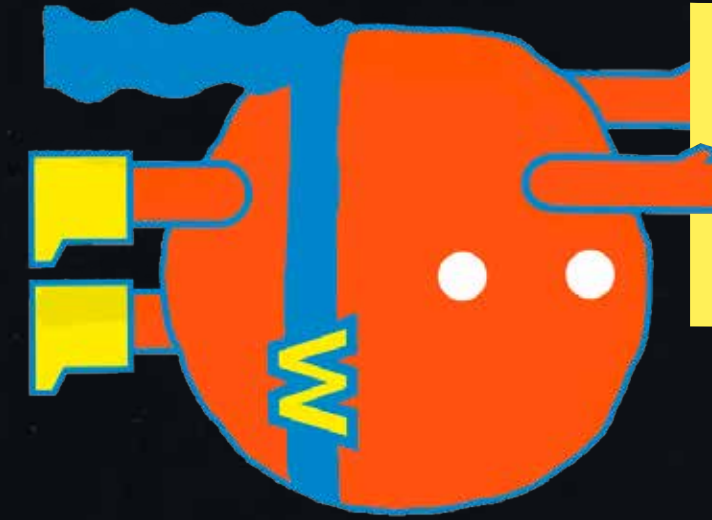


# The Ghajn hero

Dear friend, if you have answered all the questions so far, congratulations! You are now one of us, a water and sustainability hero! **Colour yourself the way you like!**



But what does this mean?  
What does a sustainability hero practically do?



**DOs and DON'Ts  
for a sustainability  
hero!**

What will your duties be as a sustainability hero from now on?  
**Complete the phrases with your own ideas!**

**As a sustainability hero, from now on ...**

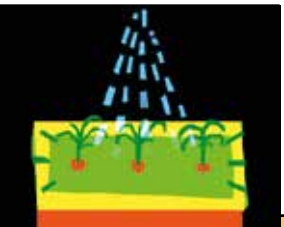
I will ...	I will not ...
I will ...	I will not ...
I will ...	I will not...
I will ...	I will not...



# Sustainability at school from A to Z

Together with your classmates create your sustainability alphabet in the form of cards. For each letter (card) write or draw an action that you can do at school.

A	B	C
G	H	I
M	N	O
S	T	U
Y	Z	

D	E	F
J	K	L
P Plant the school garden		Q
R		
V	W	X



Can you commit as a class to keep doing these actions from now on? How could you convince your less enthusiastic friends and the not so eager adults?

# Sustainability heroes in action

In 2015, the leaders of 193 countries committed to the Sustainable Development Goals (SDGs). These are 17 ambitious goals to achieve three extraordinary things by 2030: end extreme poverty, fight inequality and injustice and curb climate change.

## SUSTAINABLE DEVELOPMENT GOALS



### Maltese heroes

The work of Ekoskola: [www.ekoskola.org.mt](http://www.ekoskola.org.mt)  
Water Explorers: [www.waterexplorer.org/malta](http://www.waterexplorer.org/malta)  
Life school projects: [www.energywateragency.gov.mt/ghajn/](http://www.energywateragency.gov.mt/ghajn/)

### International heroes

Global game changers: <https://globalgamechangers.org>  
Design for Change: [www.dfcworld.com](http://www.dfcworld.com)  
Project green challenge: <https://projectgreenchallenge.com>  
Non Conventional Water in the Mediterranean: [www.ncwr-edu.net](http://www.ncwr-edu.net)



All around the world there are heroes like me and you who take action for the Sustainable Development Goals! Find out what they do and get inspired!

### Answers

#### Page 4-5: The rain collectors

- I.b, II.c, III.(depending on the season), IV.b, V.d
- Garden & archeological site (= permeable), cement areas and playground (= impermeable), roof of main building (= collection surface)
- Surface:  $20m \times 4m + 16m \times 19m = 384 \text{ m}^2$  4.Volume:  $384\text{m}^2 \times 0.012\text{m} = 4,608 \text{ m}^3$

#### Page 6: The water use explorers

- I. YES, II. YES, III. FULL 6L, HALF 2L, IV. FULL 180L, HALF 60L
- I.d, II. about 250mL or 0.25L, III. 7500mL or 4.5L
- I.c, II.a, III.c

#### Page 7: The garden experts

- a, 2I. 42 trees, 2II. e.g. rosemary, 2III. The trees serve as natural coolers

#### page 8-9: The energy investigators

- I.c, II.a, III.a, IV.d, V.d, VI.b, VII.b
- I. one, II. 60 days, III. 480 kWh, IV. 8kWh, V.  $5\text{m}^3$ , VI. 83,3 Litres, VII. Yes.

#### Page 13: The waste auditors

5. They become carbon dioxide and water

### References

Apart from those mentioned in page 18, educational recourses for teachers can be found at:  
The worlds' largest lesson: [www.worldslargestlesson.org](http://www.worldslargestlesson.org)  
The UNESCO resource bank: <https://en.unesco.org/themes/education/sdgs/material>

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This booklet is for the young visitors of the Ghajn National Water Conservation Awareness Centre that investigate how the Centre's water, energy and waste is managed and discover how they can become water and sustainability heroes! Are you one of them?



This brochure is to be used by the visitors of the 'Ghajn' Water Conservation and Awareness Centre. It has been prepared by MIO-ECSD and the Energy and Water Agency of Malta, in the frame of the LIFE 16 IPE MT 008 Project.

## Partners



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