



# BENEFIT ANALYSIS OF DWR CYMRU WELSH WATER'S EDUCATION PROGRAMME

AUGUST 2019

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## Executive Summary

Sia Partner's Benefit Analysis of Dŵr Cymru Welsh Water's Education Programme has demonstrated that the Programme can generate considerable reductions in the usage of water within its communities, even with some conservative assumptions regarding its impact on pupils' behaviour.

These water efficiencies provide both savings on customers' bills and benefits to the environment through a reduction in energy usage. Using the baseline figures for the effectiveness of the engagement, the model calculates the Programme has a Net Present Social Value of £1.99 million over a five-year period

Additionally, the Return on Investment calculation shows that for each £ the programme spends it returns £1.29 in the first year and growing to £1.98 for every £ in the fifth year.

Finally, given the costs of the Programme are primarily staff wages and therefore evenly spread over the course of the year rather than upfront costs, and given the water efficiency benefits are likely to be seen immediately following a pupil's attendance, the Programme retains a positive cashflow throughout its lifetime.

### **Monetary savings to end customers:**

Based on the scenarios modelled in our Social Return on Investment (SROI) tool, the average savings on the household water bill of all pupils who attended were shown to range between £1.68/pa to £11.33/pa (depending on the proportion of pupil's who changed their behaviour following engagement and the level of implementation of behaviours within their home).

### **Megalitres of water saved:**

Using the medium scenarios of both engagement and water efficiency behaviour uptake by the pupils, the model suggests a total saving of 1728 megalitres per day or 3.15million megalitres (over 5 years) by the households whose children have attended the Education Programme.

## Future Analysis & Next Steps

Given the limited timeframe and current data available for this project, it has not been possible to evaluate a completely exhaustive list of potential benefits.

We believe that with further time, it would be feasible to consider the additional further benefits that the Education Programme is delivering:

- avoided costs benefits of reduced maintenance and the delayed upgrade of the network as a result of lower consumption
- impact of the 'Stop the Block' programme on minimising the maintenance cost of the waste network.
- associated mental health benefits of lower bills for customers

Given all the costs have been captured within the model, these further benefits will demonstrate an even better Return on Investment of this scheme and others.

These additional benefits could also be considered when evaluating the 'Water Resilient Communities' projects, as well as Welsh Water's wider Consumer Vulnerability work.

## Company Overview

Dŵr Cymru Welsh Water is the sixth largest of the ten regulated water and sewerage companies in England and Wales and are responsible for providing over three million people in Wales, Herefordshire and parts of Deeside with a continuous, high quality supply of drinking water and for taking away, treating and properly disposing of the wastewater that is produced.

Since 2001, they have been owned, financed and managed by Glas Cymru. Unique in the water and sewerage sector, Glas Cymru is a company limited by guarantee and as such has no shareholders. Without shareholders, whatever gains that are made are returned to the customers, either in the form of further improvements to the services they receive or through lower bills.

## Initiative Overview

### A. Initiative name

The Dŵr Cymru Welsh Water Education Programme.

### B. Initiative description

The Education Programme aims to create a generation of water ambassadors by educating children through creative lessons at one of their four discovery centres, in schools and online. Every year local pupils visit an education centre where there is a wealth of interesting information and resources all linked to the national curriculum and developed with educational experts to stimulate and educate the curious minds of young people as well as informing them of key business messages.

The centres are located throughout Welsh Water's operational area in Elan Valley nr Rhayader, Cilfynydd nr Pontypridd, Cog Moors nr Dinas Powys and Brenig in the Denbighshire moors. The centres run a range of fun, practical activities and programmes so children can experience the world of water. All lessons are led by specialist teaching staff, in fully equipped classrooms, and are all linked to the National Curriculum for Key Stage 2 & 3. There are over 10 different activities to choose from which all include key core business messages on sustainability and environmental themes and have a kinaesthetic approach to ensure all the visiting young people are engaged. The lessons focus on supporting schools in science, maths, literacy and outdoor learning which are all areas of the curriculum that are difficult to teach in a classroom environment.

These centres are complemented by the Outreach programme where specialist teachers visit schools to deliver essential behaviour change campaigns, with pupils taking part in assemblies and workshops at their school.

The table below shows the number of pupils who participate in these high-quality educational activities, either education outreach activities (mostly in schools) or a session at the Education Discovery Centres:

	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	2030	2050
Actual	39k	56k	67k	62k									
Target					65k	67k	70k	72k	73k	74k	75k	85k	85k

## Finding of the Cost-Benefit Analysis

### A. Net Present Values and Net Benefit per £ spent

		Year 1	Year 2	Year 3	Year 4	Year 5
<b>Output: PV per year</b>	<b>Financial PV per year</b>	-£213,426	-£207,049	-£200,863	-£194,861	-£189,039
	<b>Social PV per year</b>	£276,235	£351,253	£416,272	£449,146	£499,414
	<b>Total PV per year</b>	£276,235	£351,253	£416,272	£449,146	£499,414
<b>Output: Net present value</b>	<b>Net Present Value (NPV)</b>	-£213,426				-£1,005,238
	<b>Net Present Social Value (NPSV)</b>	£276,235				£1,992,320
	<b>Total NPV</b>	£276,235				£1,992,320
<b>Output: Ratios</b>	<b>Net financial benefit per £ spent</b>	-£1.00				-£1.00
	<b>Net social benefit per £ spent</b>	£1.29				£1.98
	<b>Total economic benefit per £ spent</b>	£1.29				£1.98

Where:

**Financial PV per year:** the sum of all financial benefits and financial costs for each year of the project discounted using the WACC<sup>1</sup>.

**Social PV per year:** this value is the sum of all social benefits (discounted using the Social Discount Rate<sup>2</sup>) and financial costs for each year of the project. The UK Government recommends that social costs and benefits occurring in the first 30 years of a programme be discounted at an annual rate of 3.5% to put a present value on them.

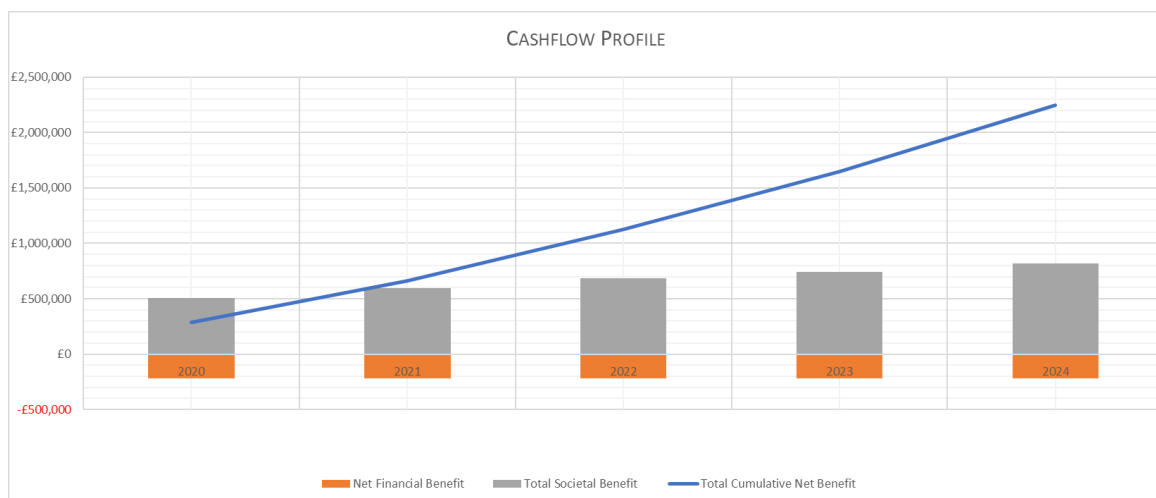
**Total PV per year:** total sum of all financial and social benefits and costs for each year of the project discounted using the WACC (financial costs and benefits) and Social Discount Rate (social benefits).

**Net present value:** the sum of all financial costs and benefits calculated in Year 1 monetary value. A positive NPV means that the financial benefits of this project outweigh its costs.

**Net present social value:** this considers only the social benefits and all costs.

**Total NPV:** this considers all costs and benefits (financial and social).

### B. Cashflow Profile



<sup>1</sup> <https://www.ofwat.gov.uk/wp-content/uploads/2019/07/PR19-draft-determinations-D%C5%B5r-Cymru-draft-determination.pdf>

<sup>2</sup> <https://www.gov.uk/government/publications/green-book-supplementary-guidance-discounting>

## Summary of Proxies and Data Sources

List of all costs and benefits associated with Education Programme classes, as well as any proxies used to monetise social benefits realised.

	Cost, benefit or proxy	Units	Value	Description	Source	Calculation
Financial costs	Education Programme	Annual	£220,000	The cost per year to run the Education Programme.	Welsh Water	N/A
Social benefits	Cost of treated water	£/litre	£0.0013856	Standard volumetric rate per cubic metre to the customer	<a href="https://www.dwrcymru.com/en/My-Account/About-My-Bill/Metered-Charges.aspx">https://www.dwrcymru.com/en/My-Account/About-My-Bill/Metered-Charges.aspx</a>	Price quoted as £1.3856 per m3. Value divided by 1000 to achieve per litre.
	Cost of sewerage	£/litre	£0.0015489	Standard volumetric rate per cubic metre to the customer	<a href="https://www.dwrcymru.com/en/My-Account/About-My-Bill/Metered-Charges.aspx">https://www.dwrcymru.com/en/My-Account/About-My-Bill/Metered-Charges.aspx</a>	Price quoted as £1.6304 per m3. Value divided by 1000 to achieve per litre, then multiplied by 0.95 (to correct for the 5% reduction in cost for sewerage per l)
	Cost of sewerage – foul only	£/litre	£0.0013736	Sewerage volumetric rate - Surface water rebated per cubic metre	<a href="https://www.dwrcymru.com/en/My-Account/About-My-Bill/Metered-Charges.aspx">https://www.dwrcymru.com/en/My-Account/About-My-Bill/Metered-Charges.aspx</a>	Price quoted as £1.4459 per m3. Value divided by 1000 to achieve per litre, then multiplied by 0.95 (to correct for the 5% reduction in cost for sewerage per l)
	Operational Greenhouse Gas Emissions from treated sewerage (per megalitre)	Kg/CO <sub>2</sub> e	83kg	Company-specific emission data created by the generation of power to treat sewage in 2018-19	<a href="https://discoverwater.co.uk/energy-emissions">https://discoverwater.co.uk/energy-emissions</a>	N/A
	Operational Greenhouse Gas Emissions from treated water (per megalitre)	Kg/CO <sub>2</sub> e	13kg	Company-specific emission data created by the generation of power to treat and supply water in 2018-19	<a href="https://discoverwater.co.uk/energy-emissions">https://discoverwater.co.uk/energy-emissions</a>	N/A

# Financial Cost - Benefit Analysis

## A. Financial Costs

Dŵr Cymru Welsh Water will incur an annual operational cost of £220,000 to run this initiative. These financial costs then have the WACC (a discounted rate of 3.08%) applied to them.

	Name	2020	2021	2022	2023	2024
Financial costs	Classes	£ 220,000	£ 220,000	£ 220,000	£ 220,000	£ 220,000
	Classes (WACC adjusted)	-£213,426	-£207,049	-£200,863	-£194,861	-£189,039
Total adjusted financial costs per year		-£213,426	-£207,049	-£200,863	-£194,861	-£189,039

## B. Financial Benefits

While no financial benefits to Dŵr Cymru Welsh Water were captured during this assessment, we do believe that there are further benefits that the Education Programme is delivering that it is not currently possible to measure due to a lack of available data:

- *A reduction in water consumption by customers will also lead to a corresponding reduction or delay in investment required in the network. This may manifest as either avoided infrastructure build or reduced ongoing maintenance.*
- *Avoided costs to the ongoing maintenance and upgrade of the network will then result lower bills as these savings are passed on to the end customers.*
- *The 'Stop the Block' programme aims to educate people to reduce what they flush or pour down the sink, preventing blockages and minimising the maintenance cost of the waste network. These reduced operational costs will result in lower bills for customers.*

## Social Benefit Analysis

Below are the stated social benefits delivered as a result of this initiative.

As all classes will be delivered by Dŵr Cymru Welsh Water without any assistance from a partner, for the benefits of this model, Welsh Water can retain all the associated benefits without need to attribute any to a third party.

Drop off is 0% because the expected benefits will not decrease over time.

### Annual Social Benefits:

This table summarises the annual social benefits that can be attributed to the Education Programme over the next five years.

	Year 1	Year 2	Year 3	Year 4	Year 5
Household Water bill savings	£352,587	£362,661	£367,698	£372,735	£377,772
CO2 saved per litre of treated sewage	£132,386	£202,089	£271,731	£343,204	£416,509
CO2 saved per litre of treated water	£21,827	£33,318	£44,800	£23,074	£23,386
<b>Total social benefits per year</b>	<b>£506,800</b>	<b>£598,068</b>	<b>£684,229</b>	<b>£739,012</b>	<b>£817,666</b>

### Water Saving Behaviours:

Below is a table of the behaviours taken from the UK Water Industry Research's (UKWIR) report *Estimating the Water Savings for Baseline Water Efficiency Activities*<sup>3</sup>. It shows a list of behaviours that attendees of an Education Programme can be expected to show following their attendance on the Programme, as well as the volume of water each behaviour would potentially save if it is fully incorporated into the daily lifestyle of the attending pupil's household:

Water saving behaviour change	litre saved per day
Taking shorter showers	17.04
Taking a shower not a bath	25.00
Using a bowl for hand washing dishes	17.54
Using a bowl for washing food/vegetables	6.50
Turning off the tap when teeth cleaning	30.96
Using a wash basin when personal washing or shaving	11.80
Using full loads in washing machine	8.30
Using full loads in dishwashers	2.00
Garden use	3.80
Repairing dripping taps	8.95

### Engagement Rate

This represents the proportion of pupils who implement a change in their behaviour following their attendance at an education session.

The report by UKWIR in 2009 issued a guideline of 18% as the upper limit for the level of engagement for school-based activities. Having reviewed the criteria that the activities must meet to attain this engagement factor set out in the report, it is our view that this Education Programme more than

<sup>3</sup> <https://ukwir.org/reports/09-WR-25-4/67232/Estimating-the-Water-Savings-for-Baseline-Water-Efficiency-Activities>



meets these standards and an engagement factor of 18% can therefore be used as the medium level of engagement.

We have added/subtracted 50% to this baseline to calculate a low and a high engagement rate to the model, demonstrating the impact that varying levels of engagement has on the Social Benefits the programme generates.

It should be noted that while the calculations for the low/high engagement rates remain relatively subjective, the upper limit of 27% has been previously used by other companies in the sector as their 'stretch' benchmark and this figure has been deemed acceptable to the regulator Ofwat.

Engagement Rate	
Low	12%
Medium	18%
High	27%

**% of water saving behaviours implemented**

Recognising that not all attendees will make comprehensive changes to all of their household's behaviours following participation in the Programme, three different factors were modelled to calculate the potential Social Benefits of these water efficient behaviours.

This factor therefore considers what proportion of water efficiency behaviours those 18% (or 12% or 27%) of pupils who have engaged in the Programme then implement.

The figures of 10%, 20% and 30% of behaviours being implemented by attendees was proposed by Sia Partners as being modest and attainable and were agreed with Welsh Water.

% of water saving behaviours implemented	
Low	10%
Medium	20%
High	30%

Additionally, we believe that there are further benefits that the Education Programme is delivering that it is not currently possible to measure due to a lack of available data:

- *With a reduction in bills, customers will benefit from the associated mental health benefits of having more available income.*

## List of General Assumptions and Limitations

### A. Limitations

- The calculations do not account for inflation or changes to the way the running costs are attributed within the business.
- Any manual calculations may not add up to the indicated result in all cases due to rounding. However, the final numbers listed are accurately calculated via the model.

### B. Assumptions:

- Savings are calculated per household. The average household size in the UK is 2.4.<sup>4</sup> However, for schools-based activities it may be possible to justify a higher average occupancy rate. A higher occupancy rate would clearly improve the benefits seen without any further costs incurred.
- The social benefits have not been calculated on a cumulative basis (i.e. the water bill savings from the households in Year 1 do not roll over into Year 2). Pupils may be a part of the Education Programme on an annual basis either through visits to a Centre or as part of the Outreach programme and we want to avoid any risk of double-counting.
- The discount rate (WACC – weighted average cost of capital) to be applied to the financial values have been fixed at 3.08%. Ofwat used their updated cost of capital for Welsh Water’s draft determination.
- The Social Discount Rate is applied to the social values and is fixed in the model at 3.50%.
- Total savings per customer bill is calculated on a weighted average:
  - 84% of households are billed for water and sewerage
  - 16% of households are billed for water and sewerage – foul only
  - Cost per litre of water was provided by Welsh Water and in cubic meters. This was converted into litres by the division of 1000
- CO<sub>2</sub> saved per litre - water treatment:
  - Figures based on latest figures provided by [DiscoverWater.co.uk](https://discoverwater.co.uk/energy-emissions) <https://discoverwater.co.uk/energy-emissions> and accessed on 19/8/19
  - Figures provided in megalitre – converted to litre by dividing by 1000
- CO<sub>2</sub> saved per litre - sewerage treatment:
  - Figures based on latest data provided by [DiscoverWater.co.uk](https://discoverwater.co.uk/energy-emissions) <https://discoverwater.co.uk/energy-emissions> and accessed on 19/8/19
  - Figures provided in megalitre – converted to litre by dividing by 1000

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<sup>4</sup> <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2016>

<sup>2</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/794186/2018-short-term-traded-carbon-values-for-appraisal-purposes.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794186/2018-short-term-traded-carbon-values-for-appraisal-purposes.pdf)

- Cost of CO<sub>2</sub>
  - Figures based on government report from the Department for Business, Energy, & Industrial strategy (BEIS) and shows updated short-term traded sector carbon values for policy appraisal, £/tCO<sub>2</sub>e (real 2018)<sup>2</sup>

Year	Low	Central	High
2018	2.33	12.76	25.51
2019	0.00	13.15	26.30
2020	0.00	13.84	27.69
2021	4.04	20.54	37.04
2022	8.08	27.24	46.40
2023	12.12	33.94	55.75
2024	16.17	40.64	65.11
2025	20.21	47.33	74.46

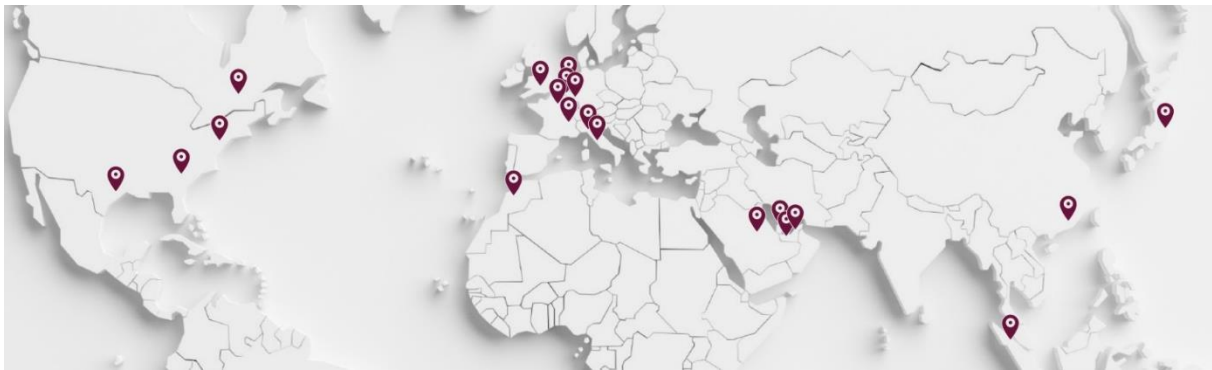
- Figures used in the calculation were the annual central scenario figures.
  - CO<sub>2</sub> reported in tonnes – converted to kg by dividing by 1000.
- Engagement rate
  - The number of people taking action following their attendance at a session
  - Low figure 12%
  - Medium figure 18%
  - High figure 27%
  - Medium figure has been chosen.
- % of water saving behaviour
  - The percentage of the water saving behaviours listed in the report that will be acted upon. This takes the engagement rate and assumes that a percentage of the water saving behaviours that were recommended have been acted upon.
  - Low figure 10%
  - Medium figure 20%
  - High figure 30%
  - Medium figure has been chosen
- Calculations for the ‘money saved per household’ are averaged across the total number of people attending the Programme per year and not just those who were engaged and implemented changes to their behaviour.
- It is assumed that all water savings behaviours in the UKWIR report are affected by the lessons taught within the Discovery Centre visits and Outreach sessions.

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## ABOUT SIA PARTNERS

Founded in 1999, Sia Partners is an independent global management consulting firm with over 770 consultants and an annual turnover of USD 140 million. The Group has 19 offices in 15 countries, including the U.S., its second biggest market. Sia Partners is renowned for its sharp expertise in the Energy, Banking, Insurance, Telecoms and Transportation sectors.



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