Tideway

SOCIAL IMPACT AND VALUE ASSESSMENT OF TIDEWAY'S LEGACY PROGRAMME

STATE OF LIFE

Technical report by State of Life

EXECUTIVE SUMMARY

This report presents the quantitative component of a robust and comprehensive evaluation of the social impact of the changes brought about by the Tideway Legacy Programme. Tideway appointed State of Life to undertake the social impact evaluation. The methodology follows HM Treasury Green Book guidance on policy appraisal and evaluation, which recommends the use of Social Cost-Benefit Analysis (Social CBA).

This evaluation report focuses exclusively on the additional activities undertaken as part of the Legacy Programme and does not include the core construction and operation of the tunnel, of which water quality benefits represent by far the largest proportion. This evaluation was commissioned to look more into what Tideway is doing to go above and beyond the bare minimum requirements around the work of constructing the tunnel. More specifically, the key focus was on Tideway's commitments to health and safety, a cleaner environment, employment and equal opportunities for everyone, innovation, arts and public realm, education and skills development, volunteering - so not just getting the work done, but doing it in a socially responsible way.

In line with Green Book guidance, we are interested in the benefits and costs experienced by any part of UK society, not just those directly involved in the project activities. From a temporal perspective, we limit ourselves to the time period when the tunnel construction, and therefore also the Legacy Programme, is ongoing: 2015 to 2024. There may be some lasting benefits and maintenance costs of the Legacy Programme that carry on beyond the construction period (such as public realm investments or supporting STEM careers) - however, we do not have enough data to make valid projections of the quantity of these benefits.

This analysis looks at the value of the legacy programme over and above the bare minimum required by Tideway's planning consent. An evaluation of a policy or project only has meaning when performed in comparison with at least one alternative scenario. In this case the chosen alternative is the 'do minimum' scenario that Tideway is bound to undertake by law or legal agreements. This scenario is also referred to as 'business as usual' or the counterfactual scenario. In this sense the analysis reflects the social value of the project's approach to delivering a legacy, not the total social value of all legacy related activities (some of which were unavoidable).

The nature and formulation of some of the 54 Legacy commitments is not conducive to social impact and value measurement. To quantify the benefits of the Legacy Programme, we identify a series of final, measurable and socially desirable outcomes brought about by Legacy activities. We call these 'Valuation Focus Areas' (VFA) and group the existing Legacy commitments under the various quantifiable VFAs. Some of the commitments are left out either because they are not sufficiently material and measurable, because they fall outside the scope of this evaluation or because there is insufficient data available to measure their quantity or value their impact. The list of VFAs and the commitments grouped under them can be seen below:

Table 1A. Valuation Framework for the Tideway Legacy Programme

VFA No.	VFA Name	Associated outcome(s)	Valuation method	Commitments covered
1	GHG emissions	CO2 equivalent emissions	Price of carbon	5 Minimise carbon footprint
2	Health and safety	Fatalities prevented Injuries prevented	Value of preventing fatalities / injuries	7 Aspire to have no major incidents on the project 8 Raise the standard of health, safety and wellbeing inductions 9 All supervisors to be trained in health and safety to a level above industry norms 10 Promote new industry occupational health standards and working practices 12 Introduce a health & safety communication standard across the Project 13 Improve Health & Safety on the river for Tideway River Transport Workers
3	Taking lorries off the road	Traffic congestion CO2 equivalent emissions Road fatalities and injuries	Price of congestion, price of carbon, value of preventing fatalities/ injuries	6 Reduction in lorry movements on the project further than the reductions agreed in the DCO 11 Introduce industry leading lorry and vulnerable road users initiatives 19 Use river transport to remove the majority (90 per cent) of material excavated to create the main tunnel
4	Employment	Additional employment	Wellbeing value of having a job	16 Create more than 4,000 direct, sustainable jobs (at peak construction) 24 Offer sustainable employment either through retention and progression on Tideway or through transition from and to other major projects 37 Promote job security through direct employment in our supply chain 38 Create employment opportunities for the workless
5	Apprenticeships	Additional apprenticeships	Wellbeing value of an apprenticeship	40 Create apprenticeship opportunities
6	People with convictions	Employment of people with convictions	Drawing on findings in the literature	43 Work with charity partners to employ one person with a criminal conviction per 100 staff on the project
7	Education	STEM careers	Drawing on findings in the literature	41 Support the STEM programme
8	London Living Wage	Higher wages to workers	Wage differential	35 Project to support the London Living Wage
9	Volunteering	Number of volunteers Hours volunteered	Wellbeing value + wage replacement	Across the board - wherever Tideway and MWC volunteers are involved in the implementation of Legacy commitments
10	Employing locally	Reduced commuting time	Wellbeing value of reduced commuting time	31 MWC employees will live in the local Borough at each drive site 32 MWC employees will live in the local Boroughs within each contract area 33 Employees to live in 14 Boroughs which are directly affected by the works 34 Employees to live in Greater London, Kent or Essex for river workers 36 Appoint skills & employment managers to work with local jobs brokerages
11	River Reconnection Partnerships	Personal wellbeing	Wellbeing valuation of 2 Tideway-funded programmes	45 Inspire people to engage in river activities and support events that will help people reconnect with the River Thames

Excluded from valuation are:

1) Commitments that are valued as part of the complementary qualitative assessment of the Tideway Legacy Programme (details of which can be found in the associated Summary Report) - 47-50, 53, 54, 39, 21, 26-28
2) Commitments that are valuable in theory but there is insufficient evidence to put a monetary value on - 20, 25, 46
3) Commitments that pertain to the core tunnel benefits - 1, 2, 3, 44, 15, 17, 18
4) Immaterial commitments i.e. commitments expressing an intent but with no specific, measurable outcome - 4, 14, 22, 29, 30, 42, 51, 52

The full list of Tideway's Legacy commitments can be found in their Legacy Brochure[1].

To estimate the benefits for each VFA, we need three components:

- An estimate of the actual quantity of the associated outcome(s) - provided by Tideway
- An estimate of the counterfactual quantity of the associated outcome(s) under the do-minimum scenario - estimated using industry averages, Tideway records, planning documents, or assumed using deadweight adjustments
- An estimate of the unit value of the outcome - taken from government guidance, State of Life research in the case of wellbeing, or other relevant research

The total social value of each VFA is the product of the unit value and the difference between the actual and the counterfactual unit quantity.

Total costs of the Legacy Programme were provided by Tideway from previous Social Return On Investment (SROI) evaluations, with adjustments made to match the coverage of the 11 VFAs' quantified benefits.

Forecasts were made for the calendar years 2022, 2023 and 2024, because actual values were not yet available. The forecasted quantities were proportional to the planned total expenditure on the entire Tideway project in the respective years (as this was the only information available on the planned future scale of work).

This study concludes that the Tideway Legacy Programme (or at least its main constituent activities that were identified as delivering the largest quantifiable social impact) **delivers approximately £1.72 of social value for every £1 invested**.

Note that the social net benefit and Benefit Cost Ratio (BCR) is unevenly spread across the years, as presented in the table below. A period of massive investment with little return gradually evolved into a period of steadily growing social benefits as investments decline, leading to the final years before the launch of this report having a considerably higher social return on investment (up to 4.68 in 2020). The final three construction years (2022 to 2024) use forecasted values and are not indicative of any possible patterns in the yearly BCR of the Legacy Programme in the remaining years.

Potential reasons for this upward trajectory of the yearly BCR are delayed returns on investment or inaccurate / out-of-date cost information. More details are in Section 2.4.

1 https://www.tideway.london/media/1624/tideway-legacy-brochure_2017.pdf

Table CBA1. Total benefits and costs, net benefits and BCR of the Tideway Legacy Programme

Year	Total Benefits	Total Costs	**Net Benefit**	**Benefit-Cost Ratio**
2015	£1,190,454	£10,786,440	**-£9,595,986**	**0.11**
2016	£3,707,306	£6,680,436	**-£2,973,130**	**0.55**
2017	£7,658,805	£8,348,108	**-£689,303**	**0.92**
2018	£15,101,995	£9,388,885	**£5,713,110**	**1.61**
2019	£21,981,258	£8,768,468	**£13,212,790**	**2.51**
2020	£14,900,385	£3,181,802	**£11,718,583**	**4.68**
2021	£10,427,428	£2,932,900	**£7,494,528**	**3.56**
2022	£11,897,309	£2,580,587	**£9,316,722**	**4.61**
2023	£6,102,432	£2,193,018	**£3,909,413**	**2.78**
2024	£4,097,182	£1,607,824	**£2,489,358**	**2.55**
Total value	£96,585,773	£56,287,405	**£40,298,368**	**1.72**

The benefits of the Tideway Legacy Programme are spread across the different valuation areas. An overview is given in the table below. We can see that employment-related areas (providing job opportunities and apprenticeships) contribute less to the total benefits (most likely because of their relatively smaller scale). Accident prevention contributes the highest amount of social benefits (over 19% of the total), followed by the river reconnection partnerships, reducing lorry movement by using the river for transportation, paying a fair wage and promoting STEM careers.

Table CBA2. Total benefits by VFA of the Tideway Legacy Programme

Area	**Area name**	**Value**	**% of total benefits**
VFA 1	Greenhouse gas emissions	£4,872,584	5.04%
VFA 2	Accident prevention	£18,750,688	19.41%
VFA 3	Taking lorries off the road	£16,001,976	16.57%
VFA 4	Employment of the workless	£4,760,720	4.93%
VFA 5	Apprenticeships	£624,307	0.65%
VFA 6	People with convictions	£2,260,649	2.34%
VFA 7	STEM careers	£8,050,543	8.34%
VFA 8	London Living Wage	£15,117,339	15.65%
VFA 9	Volunteering	£5,641,175	5.84%
VFA 10	Local employment	£2,304,547	2.39%
VFA 11	River Reconnection	£18,201,246	18.84%
Total Benefits		**£96,585,773**	**100.00%**
Total Costs		£56,287,405	
Net Benefit		**£40,298,368**	
Benefit-Cost Ratio		**1.72**	

There are a series of limitations to the findings in this report. Legacy Programme monitoring was limited to the indicators defined as targets for the 54 Legacy commitments. Many of these do not relate to a specific, measurable and material social outcome. Multiple elements of the Social CBA in this study were therefore left with significant data gaps, even though efforts were made to overcome them. More details are in Section 2.5, accompanied by recommendations in Section 3 on what can be done better in the future to improve the validity of social impact and value assessments of large infrastructure projects in general.

INTRODUCTION

Tideway is upgrading London's sewer system to cope with its growing population by building a 25 km tunnel under the River Thames. The project will reduce sewage overflows, improve water quality, and reconnect London with the River Thames.

The Tideway Legacy Programme is a set of 54 commitments against 10 objectives designed to maximise the social value created through construction of the new tunnel. The Legacy Programme includes commitments across five themes: Environment; Health, Safety and Wellbeing; Economy; People; and Place.

Tideway have commissioned State of Life to undertake a robust and comprehensive evaluation of the social impact of the changes brought about by the Tideway Legacy programme in areas such as the environment, health and safety, skills and employment, education and training, diversity and inclusion, fair wages, supporting the local economy, volunteering, community investment, innovation, and improving the public realm.

The evaluation consists of a quantitative research component, and a qualitative research component. Findings from the qualitative research component can be found in the Summary Report. This report solely covers the quantitative social impact and value assessment of the most significant constituent components of the Tideway Legacy Programme. The methodology is presented in Sections 1, 2.1 and 2,2, the findings - in Sections 2.3 and 2.4, and Section 3 wraps up with a series of lessons learned and recommendations for future social impact evaluations in the infrastructure sector.

1. OUR APPROACH TO SOCIAL IMPACT ASSESSMENT

Our approach follows HM Treasury's Green Book (2020)[2], the main piece of guidance on policy appraisal and evaluation for UK government departments and other public bodies. The Green Book states that an intervention, programme, or any other public undertaking such as the Thames Tideway Tunnel should be evaluated in terms of their social value, defined as follows (page 5):

> *Social or public value includes all significant costs and benefits that affect the welfare and wellbeing of the population, not just market effects. For example, environmental, cultural, health, social care, justice and security effects are included. This welfare and wellbeing consideration applies to the entire population that is served by the government.*

We use Social Cost Benefit Analysis (CBA) - the main quantitative appraisal and evaluation framework from the Green Book - to perform an impact evaluation of the Tideway Legacy programme. This entails:

1. Identifying, to the fullest possible extent, the costs and benefits (both financial and non-financial) generated by the Tideway Legacy Programme to any parts of the UK population, compared to the business-as-usual scenario where the Tideway Legacy Programme hadn't been adopted.
2. Estimating the magnitude and equivalent monetary value of the costs and benefits where possible (quantitative analysis). Costs and benefits that could not be monetised were considered as part of the qualitative analysis - see Summary Report for details.
3. The monetised costs and benefits are totalled across themselves and over time (applying time value discounting where appropriate), and the total costs are subtracted from the total benefits to arrive at the **net benefit**, which represents the net socioeconomic worth (social value) of implementing the Tideway Legacy Programme compared to business-as-usual (tunnel construction with consenting obligations only). If the net benefit is positive (greater than 0), then the Legacy Programme was a worthwhile investment from a socioeconomic perspective.
4. An alternative metric can be obtained by dividing the total benefits by the total costs. This metric is known as the **benefit-cost ratio** (BCR) or alternatively as the **Social Return on Investment** (SROI) and expresses the social value of the programme generated per each £1 spent on the programme. Similarly to the net benefit, this metric can be used to judge whether the programme was a worthwhile investment from a socioeconomic perspective - the BCR must be greater than 1 for this to be the case.

While the Green Book guidelines to performing Social CBA are the main framework used to perform this social value assessment, by following these guidelines we also adhere to the principles of SROI developed by Social Value UK[3].

2 The Green Book
3 https://socialvalueuk.org/wp-content/uploads/2016/03/Principles_of_Social_Value.pdf

Scope

The scope of this evaluation must be clarified from the start. We are interested in the costs and benefits borne by any part of the UK society as a consequence of this programme. This can be the client organisation (Tideway), the main works contractors (MWCs) and any subcontractors, the organisation responsible for operation and maintenance (Thames Water), local or national public authorities, employees of these organisations, residents of local areas or any other people that will benefit from the improvements brought about by the Tideway Legacy Programme (e.g. any passers-by that will use or see the improvements in public realm, any attendees of the educational and training activities and so on). Considering the costs and benefits to the entire UK society is in line with Green Book guidance and is the standard for the appraisal and evaluation of public infrastructure projects.

It was decided that the core benefits arising from the use of the tunnel once it is operational are excluded from the scope of this evaluation. A previous evaluation of the environmental and water quality benefits resulting from the construction of the Tideway Tunnel was conducted in 2014 by consultants Eftec for the project's sponsoring government department, DEFRA, as part of the business case for the project[4]. Water quality benefits represent by far the largest proportion of social value generated by the tunnel. However, this evaluation was commissioned to look more into what Tideway is doing to go above and beyond the bare minimum requirements around the work of constructing the tunnel. More specifically, the key focus was on Tideway's commitments to health and safety, a cleaner environment, employment and equal opportunities for everyone, innovation, arts and public realm, education and skills development, volunteering - so not just getting the work done, but doing it in a socially responsible way.

The full list of outcomes considered and the methods used to estimate the associated social value is described in more detail in Section 2.

From a temporal perspective, a Social Cost-Benefit Analysis normally considers all the benefits and costs attributable to the Legacy Programme at any time. Clearly most of the Legacy Programme activities (and therefore the associated costs and benefits) take place during the construction of the tunnel, but there may be some lasting benefits and maintenance costs of the Legacy Programme that carry on beyond the construction period (such as public realm investments or supporting STEM careers) - however, we don't have sufficient data to account for these.

Benefits and costs must be separated by year, and those that happen in the future (2023 and 2024) are discounted using Green Book-advised social discount rates. According to Green Book recommendations, when accounting for time value of money, values for past years should not be inflated. Therefore, no time discounting factor is applied for years up to and including 2022.

4 DEFRA, Costs and benefits of the Thames Tideway Tunnel (October 2015).

The counterfactual

From a causal perspective, we need to explain the concept of a counterfactual (or business-as-usual) scenario. In order to be able to say that something is a benefit (or cost) of the Legacy Programme, we need to ascertain whether it would have happened if the Legacy Programme were not in place. This is the counterfactual scenario. Only if we have reasonable confidence that the respective outcome would not materialise in the counterfactual scenario, can we say that the outcome is **caused by** or **attributable to** the Legacy Programme, and include the respective outcome in the social CBA of the Legacy Programme. The counterfactual is a hypothetical scenario, and conjectures must be made given the best available data to infer what the various outcome levels would be if the Tideway tunnel had been constructed without the Legacy Programme.

We mentioned above that the scope of this evaluation is limited to the Legacy Programme, and not to the whole project . The counterfactual is therefore a 'do-minimum' scenario in terms of the legacy commitments - where the construction of the tunnel would go ahead replacing the adherence to the legacy commitments (in the areas of environment, health and safety, skills and employment, education and training, diversity and inclusion, fair wages, supporting the local economy, volunteering, community investment, innovation, improving the public realm etc.) with the minimal legal requirements that would enable the tunnel construction to go ahead, outlined by the agreements between Tideway and the local and national public authorities - the Section 106 and Development Consent Order (DCO) requirements.

2. VALUATION OF THE LEGACY PROGRAMME

The Tideway Legacy Programme consists of 54 commitments, the majority of which are to be delivered during the construction of the tunnel (5 out of 54 will not be realised until operation). However, most of these commitments are not directly valuable under a social CBA. This is because, according to Green Book principles (as well as SROI principle 4 - 'only include what is material'), we can only place a value on specific, measurable, and **final** outcomes, whose benefit to society has been agreed upon and well established. Examples of such outcomes are employment, education, reductions in crime, carbon emissions, prevented accidents and fatalities, health and wellbeing, volunteering, or any directly monetisable economic outcome such as GDP increases. What cannot be valued directly are processes, strategies, initiatives or vision statements, except to the extent that these strategies and processes succeeded in bringing about directly measurable changes in specific final outcomes (see Table 1 for details).

2.1. Valuation Focus Areas

Therefore, as a first step of the social value assessment, we identify a series of Valuation Focus Areas (VFA). Each VFA is a key area impacted by Tideway Legacy Programme activities and is connected to one or more monetisable social outcomes which can be assessed and valued as one of the components of the social value of Tideway's Legacy Programme. The 54 legacy commitments, in turn, are grouped under the different VFAs, with some commitments classified as 'immaterial' and left out of the valuation framework. A summary of the valuation framework showing the identified VFAs and the legacy commitments they cover, as well as the associated outcomes that are to be valued, is presented below.

Table 1. Valuation Framework for the Tideway Legacy Programme

VFA No.	VFA Name	Associated outcome(s)	Valuation method	Commitments covered
1	GHG emissions	CO2 equivalent emissions	Price of carbon	5 Minimise carbon footprint
2	Health and safety	Fatalities prevented Injuries prevented	Value of preventing fatalities / injuries	7 Aspire to have no major incidents on the project 9 All supervisors to be trained in health and safety to a level above industry norms 10 Promote new industry occupational health standards and working practices 12 Introduce a health & safety communication standard across the Project 13 Improve Health & Safety on the river for Tideway River Transport Workers
3	Lorry movements reduction	Traffic congestion CO2 equivalent emissions Road fatalities and injuries	Price of congestion, price of carbon, value of preventing fatalities/injuries	6 Reduction in lorry movements on the project further than the reductions agreed in the DCO 11 Introduce industry leading lorry and vulnerable road users initiatives 19 Use river transport to remove the majority (90 per cent) of material excavated to create the main tunnel
4	Employment	Additional employment	Wellbeing value of having a job	16 Create more than 4,000 direct, sustainable jobs (at peak construction) 24 Offer sustainable employment either through retention and progression on Tideway or through transition from and to other major projects 37 Promote job security through direct employment in our supply chain 38 Create employment opportunities for the workless
5	Apprenticeships	Additional apprenticeships	Wellbeing value of an apprenticeship	40 Create apprenticeship opportunities
6	People with convictions	Employment of people with convictions	Drawing on findings in the literature	43 Work with charity partners to employ one person with a criminal conviction per 100 staff on the project
7	Education	STEM careers	Drawing on findings in the literature	41 Support the STEM programme
8	London Living Wage	Higher wages to workers	Wage differential	35 Project to support the London Living Wage
9	Volunteering	Number of volunteers Hours volunteered	Wellbeing value + wage replacement	Across the board - wherever Tideway and MWC volunteers are involved in the implementation of Legacy commitments
10	Employing locally	Reduced commuting time	Wellbeing value of reduced commuting time	31 MWC employees will live in the local Borough at each drive site 32 MWC employees will live in the local Boroughs within each contract area 33 Employees to live in 14 Boroughs which are directly affected by the works 34 Employees to live in Greater London, Kent or Essex for river workers 36 Appoint skills & employment managers to work with local jobs brokerages
11	River reconnection partnerships	Personal wellbeing	Wellbeing valuation of two Tideway-funded programmes	45 Inspire people to engage in river activities and support events that will help people reconnect with the River Thames
A1	Staff Training	Number of training hours	Mentioned descriptively under VFA2 and VFA7	20 Support the development of river transport related skills through Thames Skills Academy 25 Continue to support the Tunnelling and Underground Construction Academy (TUCA)

A2	Tree planting	Lower GHG effect, increased wellbeing from proximity to green space	Mentioned descriptively under VFA1	46 Design principles to increase number of trees
QL1	Health & Safety		Qualitative assessment	8 Raise the standard of health, safety and wellbeing inductions
QL2	Creating an inclusive workplace		Qualitative assessment	39 Create an inclusive environment that will enhance diversity across Tideway and aim to set new standards for the industry
QL3	Embedding Innovation		Qualitative assessment	21 Encourage modernisation of marine equipment through procurement process 26 Share our innovations with the industry so they can benefit future projects 27 Design a procurement approach that will encourage innovation 28 Create commercial arrangements that encourage innovation and shared risk
QL4	Reconnecting Londoners with the river		Qualitative assessment	45 Inspire people to engage in river activities and support events that will help people reconnect with the River Thames 53 Contractors to deliver and fund local community investment activities and where possible encourage members of that community to come together 54 Deliver and fund pan-London community investment activities which bring communities together from across the capital
QL5	Public realm		Qualitative assessment	47 Additional and enhanced public space available to the public 48 Enhance the Thames path 49 Give people of reduced mobility the opportunity to connect with the River 50 Use a Heritage Interpretation Strategy and Public Art Strategy
CT1	Improved water quality		Not valued - consequence of core tunnel construction	1 Improve water quality and reduce biochemical oxygen demands in the tidal Thames by dramatically reducing CSO discharges into the river 2 Reduce adverse litter conditions 3 Provide infrastructure that supports more resilient biodiversity 44 A significant reduction in health risks from water borne pathogens
CT2	Fine prevention		Not valued - consequence of core tunnel construction, also moot due to Brexit	15 Remove the immediate risk of EU imposed infraction fines
CT3	Supporting UK economy		Not valued - consequence of core tunnel construction	17 Create a visible, informed and engaged supply chain that can compete for contract opportunities 18 Demonstrate Tideway is supporting the London and UK economy
	Immaterial	These commitments are considered harder to link to specific, measurable and valuable outcomes	Not valued	4 Undertake and support research to aid understanding of habitats and aquatic ecology of the River Thames 14 Provide London's essential Infrastructure through an enhanced sewerage system that supports growth 22 Seek opportunities to support the continued use of river infrastructure such as enhanced river walls 29 A procurement process that supports payment to SMEs within 30 days of invoice - Fair payment charter 30 Support ethical sourcing practices in the supply chain 42 Provide teaching & learning resources. 51 Collaborate with other developers to enhance local space, where our activities overlap with other local developments 52 Develop sustainable strategies for the long term maintenance of public realm

All in all, one can see the VFAs that make up this social value assessment can be classified into several groups:

1. (VFAs 1-11) The ones that include rather traditional socio-economic outcomes (employment, wages, CO2 emissions, injuries and fatalities etc.) that HMT Green Book mentions directly and prescribes a method to value them. These are valued quantitatively using standard social CBA procedure - as a product of A) the outcome unit value prescribed by the respective government guidance (e.g. CO2e prices) and B) the outcome unit quantity that is impacted by the Legacy Programme, that is, the difference between the actual and counterfactual level of the outcome - more details in Section 2.2.
2. (A1-A2) Some outcome groups represent a vague benefit that can be thought of as subordinate to the core benefits in point 1 above. These are described anecdotally in the respective VFA sections, briefly mentioning what Tideway is doing in this regard and why it is beneficial, but without assigning them an explicit monetary value. This is because these commitments cannot be thought of as contributing 'directly' to the respective outcome - for example, employing locally represents a displacement of employment rather than additional employment from a society-wide perspective.
3. (QL1-QL5) The ones that include more vague but nonetheless material socio-economic outcomes (innovation, public realm etc.) are valued qualitatively by gathering information through interviews with stakeholders, focus groups and case studies. The aim of these is to understand the social value that can be attributed to these outcomes. These qualitative findings can be found in the Summary Report.
4. (CT1-CT3) Some outcomes are inseparable from the core tunnel construction. This is the case, for example, for improving water quality, which was the main subject of the Eftec evaluation for Defra (2014) as part of the business case for the construction of the tunnel itself. The main problem is that it is impossible to envision a counterfactual scenario where the tunnel is built but improved water quality - covered by commitments 1, 2, 3 and 44 - is not realised. We place zero value on these outcomes - although there are legacy commitments covering them, they are realised 'by default' and there is no plausible counterfactual to compare them against in this evaluation whose scope is limited to the Legacy Programme.
5. (Immaterial) Some of the Legacy commitments describe processes, strategies and initiatives that are harder to link to a specific measurable and valuable outcome. These have been classified as immaterial and left out of the valuation process. One may note that some of these commitments can be reclassified under existing VFAs, just like outcome groups A1-A2, without any material change in the social value estimates.

In the remainder of this study, we are not valuing any Legacy commitments directly, but we are valuing the outcomes we've identified for the first 11, quantitative VFAs as laid out in the table above. The Legacy commitments are merely 'assigned' to the respective VFAs, based on the broad topic the commitment covers and the final outcomes it aims to achieve. If no such final outcome could be identified or it was too vague, the commitment was moved down to the unvalued/immaterial areas. The general logic for grouping commitments under VFAs was trying to group together all the commitments that were broadly aimed at achieving the same outcomes, even if some of these commitments may describe rather immaterial or intangible processes and standards. Changing the grouping of commitments has no effect on the final value as long as the VFAs remain the same.

2.2. Quantitative approach - benefits estimation

Each of the outcomes in rows 1-10 of Table 1 above is valued according to a variation of the following formula:

$$SV_i = \Delta Q_i * UV_i = (Q_i^{LP} - Q_i^{BAU}) * UV_i$$

Here, SV_i is the social value of outcome i. ΔQ_i is the change in the unit quantity of outcome i attributable to the Tideway Legacy Programme, and it is equal to the actual quantity of outcome i with the Legacy Programme in place (Q_i^{LP}) and the counterfactual quantity of outcome i under the Business As Usual scenario (Q_i^{BAU}), where construction of the tunnel proceeds without adhering to the Legacy commitments. Finally, UV_i is the estimated social value of one unit of outcome i (unit value).

Defining and estimating these components represents the brunt of the quantitative part of the social value assessment. The easiest component to determine is the actual quantity, because often (though not always) it can be taken directly from Tideway records. The counterfactual quantity is considerably trickier, because it represents a hypothetical situation that cannot be observed in reality. It has to be estimated by considering either industry or country averages, or in the lack of a better option, by applying a flat deadweight percentage under the assumption that X% of the outcome would have happened anyway. Ideally the deadweight percentage should be retrieved from related studies in the sector, but to be fully frank, the lack of suitable information sometimes leads to a very rough deadweight estimate without the backing of solid evidence.

However, sometimes even the actual outcomes cannot be extracted from company records because they are not directly measured. In that situation, they must be extrapolated from the available information. This is the case, for example, for the traffic outcomes in VFA 3 or STEM careers in VFA 7.

Thus, Tideway measured the distance travelled by HGVs (lorries) owing to the project, both actual and counterfactual - how much would have been needed for the project had river transport not been used. But the amount of congestion or the number of accidents prevented could not be measured because it is obviously beyond the reach of Tideway's direct operations. It was therefore extrapolated using data from UK DfT Road Accident Statistics by dividing the total number of fatalities in accidents involving HGVs in a year, and total distance travelled by HGVs in the UK.

For STEM careers, one generally knows the number of schoolchildren participating in a particular activity, but it is hard to say how many of them will be persuaded by this activity to take up a STEM career, as this will not be known until long into the future (and tracking the participants' future lives would be extremely difficult). Therefore one has to consult the literature and make an educated guess regarding the assumed "success rate" of such events, that is, the proportion of participants that are determined by this particular type of event to choose a career in STEM. Also, the data collected by Tideway, in the form of a single number of attendees per event, does not allow accounting for overlap - how many of these are the same attendees who also participate in other events or in multiple recurring events.

In the worst-case scenario, estimating the counterfactual may boil down to a simple deadweight adjustment where the impact is diminished by X% that is assumed to have happened anyway in the counterfactual scenario, and the best choice for X% is decided from literature review and stakeholder consultations. But we strive as much as possible to ensure a fair level of confidence for all counterfactual estimates.

The unit value is an estimate of the monetary equivalent of the benefit to society from achieving one unit of the outcome - employing one person, preventing one tonne of CO2 emissions, preventing one fatality, volunteering for one hour etc. Multiple techniques to measure these have been developed in recent years by government economists and social value practitioners. The simplest ones revolve around finding market equivalent rates (wage replacement for hours volunteered, traded/non-traded carbon prices). Other

techniques involve surveys asking respondents their willingness to pay to experience the outcome. Another valuation method which gained a lot of traction lately and is used extensively in this study is to examine the impacts of a particular outcome on the individual's personal wellbeing, for which a recommended monetary conversion rate has now been published in HM Government supplementary guidance[5].

Another complicating factor is worth mentioning - namely that some outcomes persist for a longer time period. Other outcomes, even if they are momentary, have benefits that persist for some time; this is especially true for wellbeing benefits. Employment is a good example of such a durable outcome - it will keep generating benefits for as long as the person is employed, and likely even some time afterwards. The unit value of wellbeing benefits is by convention provided in annual terms; if the outcome or its wellbeing effects last for a different length of time, the value must be scaled accordingly.

Forecasting

The tunnel is not yet complete - construction completion is scheduled in 2024 followed by a commissioning period and handover in 2025. The Legacy Programme is therefore also still ongoing. Data on the various Legacy Programme outputs is available up to the time before this final report was drafted (March 2022 or December 2021 for most outputs). Thus the final 3 years of the Tideway Legacy Programme are not covered by actual data because they are still in the future at the time of the conclusion of this study, and must be forecasted.

Forecasts for the quantities of the outputs themselves involved in the valuation are not available. The only feasible approach is to use an estimate of the general distribution over time of the total work performed on the Tideway project, and apply this proportion to all outputs to be forecasted.

Full-time employment equivalents (FTEs), and therefore any Legacy Programme outputs that FTEs feed into (VFAs 2, 8, 10), are forecast proportionally to estimates of the total (actual and forecasted) annual expenditure on the entire Tideway project.

For all other Legacy Programme outputs (VFAs 3, 4, 5, 6, 7, 9) and costs (Table 2), the forecast is based on the Tideway Legacy Programme Completion Timeline and internal estimates of Tideway staff, which broadly describe the expected intensity of Legacy Programme activities in the remaining years as follows:

2022	90% of 2021 values for the respective output or cost
2023	90% of 2022 values for the respective output or cost
2024	75% of 2023 values for the respective output or cost

Note that this approach assumes that the intensities of every activity in the Legacy Programme in the remaining years are proportional to each other. This is a simplification and is not very accurate, but it is the only way of forecasting future Legacy Programme outputs given available data.

5 Wellbeing Guidance for Appraisal

2.3. Social value derived from quantitative analysis

We proceed to describe the valuation of each VFA in detail. This section goes through the costs of the Legacy Programme and the benefits from Valuation Focus Areas 1-11 one by one and describes in detail the models, input data, and assumptions used to estimate the social value of the associated outcomes according to the model presented in Section 2.2. Forecasts are used for the years 2022-2024, as described above. Therefore, the resulting social value figures are still subject to revisions and updates when the Tideway Legacy programme concludes in 2024.

Because the valuations involve monetary figures from different years, all monetary values are inflation-adjusted to base year 2019 using the Bank of England inflation calculator[6].

The VFA subsections all follow a similar structure:

- A brief description of the VFA, its associated outcome(s) and why it is important;
- Unit value of the outcome(s) with references to the sources used;
- Unit quantities of the outcome(s) - actual and counterfactual - with reference to sources;
- A table listing unit value, unit quantity and total value by year. Generally total value = unit value * (actual quantity - counterfactual quantity) for positive outcomes[7];

Costs

The costs of the Legacy Programme are a direct, financial outcome. They represent the total amount of monetary expenditure on implementing the Legacy Programme commitments in the areas of environment, health and safety, skills and employment, education and training, diversity and inclusion, fair wages, supporting the local economy, volunteering, community investment, innovation, improving the public realm etc. They exclude the costs associated with the core tunnel construction or the normal operation of Tideway and the MWCs.

In many evaluations, costs are easy to obtain because they can be taken from the accounting records of the programme. Difficulties were sometimes encountered in isolating the costs that can be attributed to the Tideway Legacy Programme. The information we used was based on the costs associated with planning and delivering the Legacy Programme that were produced by Tideway representatives for an earlier SROI evaluation. The costs consist of many different items, among which:

- The MWCs' and Tideway's Legacy budgets (includes community investment, skills and employment, STEM)
- Tideway and MWC staff time to deliver/oversee the Legacy Commitments
- The Tideway Health and Safety budget
- Education and training courses development
- Investment in the Thames Skills Academy (TSA) and Tunnelling and Underground Construction Academy (TUCA)
- Funds allocated to various Legacy Initiatives - i3P, CompeteFor, Encompass, Build London
- Opportunity cost of volunteer hours

6 https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator
7 The expression changes sign for negative outcomes such as fatalities, injuries or GHG emissions.

Information on the costs above was derived from a previous social value assessment after consulting Tideway representatives responsible for those areas, to the extent it was possible. We therefore assume them to be sufficiently accurate and reliable for the purpose of this study. Note that some items were left as £0 values, because either the authors were unable to work out the costs, or the items were not costed separately because the respective investment had already been accounted for under other items. Of the remaining cost items, we further removed some that were not directly relevant to generating the final and material benefits covered by the 11 VFAs and monetised in this study - it is only fair that if we leave the other benefits out of scope of the social CBA, we should leave out the corresponding costs as well.

The previous costs only anticipated Legacy Programme costs being incurred up to and including FY 2021/22 (even though the original completion date was March 2024). Subsequently the Tideway project has been delayed for 9 months due to COVID-19, and the timescales of the Legacy Programme have also changed. The years 2022, 2023 and 2024 now involve Legacy Programme activities, albeit with reduced intensity. To adapt for this, general forecasting methodology was used to predict the additional costs related to the Legacy Programme incurred in these future years. Relevant costs and forecasted future costs are summarised below:

Table 2. Valuation summary for Tideway Legacy Programme costs

Calendar Year	Full cost	Total relevant cost	Inflation adjustment	**Cost in 2019 £**
2015	£11,775,095	£9,950,916	1.0840	**£10,786,440**
2016	£8,979,362	£6,294,468	1.0613	**£6,680,436**
2017	£12,023,632	£8,014,468	1.0416	**£8,348,108**
2018	£12,738,734	£9,206,468	1.0198	**£9,388,885**
2019	£11,745,059	£8,768,468	1.0000	**£8,768,468**
2020	£4,582,477	£3,240,368	0.9819	**£3,181,802**
2021	£3,413,177	£3,044,368	0.9634	**£2,932,900**
Forecast 2022	£3,071,859	£2,731,003	0.9449	**£2,580,587**
Forecast 2023	£2,764,673	£2,367,002	0.9265	**£2,193,018**
Forecast 2024	£2,073,505	£1,775,252	0.9057	**£1,607,824**

VFA 1 - Greenhouse Gas Emissions

Reducing greenhouse gas emissions is a globally recognised objective that is crucial to protect our environment. According to guidance published by the department for Business, Energy and Industrial Strategy (BEIS) on Valuation of Energy use and Greenhouse Gas Emissions,[8] greenhouse gas (GHG) emissions are normally expressed in tonnes of carbon dioxide equivalents (tCO_2e). These are valued using the non-traded carbon prices (central variant) for the respective year in which the emissions take place[9].

On the quantity side, we use two sets of emissions - those produced by Tideway for the construction of the tunnel (actual) and those that would have been produced if the legacy commitments had not been adopted (counterfactual). The environmental impact of the Legacy Programme is the difference between the counterfactual and actual quantity of CO_2 equivalent emissions.

8 /valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal-2018.pdf

9 Data Tables supporting BEIS guidance, Table 3. These values are expressed in 2018 pounds, and we therefore readjust them to 2019 pounds.

Actual emission quantities are obtained from the Tideway Climate-Related Financial Disclosure Report[10], Appendix B (page 14), up to FY 2020/21, an email from Tideway representatives for the rest of 2021, and with forecasting used from 2022 onwards. Furthermore, Tideway has officially declared an estimated carbon footprint at project completion of 768,756 tCO2e, and the forecasts for 2022 to 2024 are scaled to match this final target at project completion.

Counterfactual quantities were trickier to estimate. The Energy and Carbon Footprint Report of Tideway's application for Development Consent (January 2013)[11] states in Paragraph EX 1.5 that the anticipated total GHG emissions of the project were estimated at 840,000 tCO2e. This is what we use as a starting point for the counterfactual - we spread out this total across individual years proportionally with each year's share of actual emissions as part of the actual project total.

Comparing this counterfactual value to the official estimated emissions target of around 768,756 tCO2e, Tideway is on course to achieve about an 8% reduction in carbon emissions compared to the minimal required values as agreed in the Development Consent Order.

A summary of the valuation for VFA 1 based on the unit prices and impact quantity presented above can be found in the table below.

Table VFA1. Valuation summary for GHG emissions

Year	Non-traded central carbon price adjusted to 2019 £	Quantity of emissions - actual, tCO2e	Quantity of emissions - counterfactual, tCO2e	**Total value**
2016	£66.56	3,779	4,129	**£23,309**
2017	£67.56	47,953	52,396	**£300,246**
2018	£68.58	97,932	107,008	**£622,440**
2019	£69.60	114,263	124,852	**£737,037**
2020	£70.65	94,470	103,225	**£618,559**
2021	£71.83	120,566	131,739	**£802,534**
2022	£73.01	129,652	141,668	**£877,230**
2023	£74.18	73,337	80,134	**£504,171**
2024	£75.36	61,980	67,724	**£432,890**
Total emissions		**768,756**	**840,000**	

Tideway's large-scale efforts to reduce GHG emissions are complemented by more symbolic but illustrative contributions to maintaining a green environment by planting trees. Tideway promised, as part of Legacy Commitment 46, to plant at least 2 trees for every tree that had to be cut down as a result of construction work on the project. Tideway and the MWCs, as well as their charity partners Trees for Cities, had planted 267 trees by March 2022 since the beginning of the project and plan to have planted 550 trees at project completion.

10 https://www.tideway.london/media/5100/j0114_-climate-related-financial-disclosure-report-vis5-2.pdf
11 http://www.energyforlondon.org/wp-content/uploads/2013/05/Thames-Tideway-7.08_Energy_and_Carbon_Footprint_Report.pdf

VFA 2 - Health and Safety in the workplace (reduced injuries and fatalities)

Occupational health and safety is very important for the construction industry, because it is a sector in which accidents and injuries happen more often than the average across the economy. According to HSE Construction Statistics,[12] fatalities in construction were almost four times more frequent than the all-industry average in 2019/20, whereas non-fatal injuries were about 1.6 times more common.

Valuation of fatalities and injuries has been developed by the Department for Transport (DfT) in the 1990s[13] and has since been extended to cover all policy areas that change the statistical probability of fatalities, injuries and accidents. It is also acknowledged by the Green Book (§6.36 - 6.38 in the 2020 edition).

We draw upon the unit value estimates for fatalities, serious injuries and slight injuries from the DfT Transport Assessment Guidance (TAG) Data Book[14], Table A4.1.1. These are 2010 values expressed in 2010 pounds, and therefore we make two adjustments. First, we adjust for inflation to express all values in 2019 pounds as is the standard throughout this assessment. Second, because these values originate from willingness to pay (WTP) studies, they are expected to grow as household income increases with time, and we therefore adjust for average income levels based on the real GDP per capita index for the year being valued relative to 2010 (both taken from the Annual Parameters worksheet of the TAG Data Book).

On the quantity side, we use three outcomes: the number of a) fatalities, b) serious injuries and c) slight injuries. As is always the case throughout this study, we use two sets of outcomes for each - actual and counterfactual (what would have happened without the legacy programme). Actual numbers of fatalities and injuries are obtained from Tideway RIDDOR records. For ease of compatibility with valuation criteria, we match injuries causing seven or more days of absence as serious injuries and the remaining injuries as slight injuries[15]. Forecasts are used from 2022 onwards.

Counterfactual fatality and injury estimates are obtained using average rates for the construction industry. Rates per 100,000 workers of fatalities, non-fatal injuries with over 7 days absence, and all non-fatal injuries are drawn from the workplace injuries statistics from the HSE[16] for the construction sector. Years in the future are forecasted using a constant growth rate equal to the average of the yearly growth rates in 2017-2021. These are multiplied by the average full-time equivalent (FTE) employment of Tideway and all three Tideway Main Works Contractors (MWCs) throughout the respective year to obtain the counterfactual fatality and injury estimates.

12 https://www.hse.gov.uk/statistics/industry/construction.pdf
13 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/995110/rrcgb-valuation-methodology.pdf
14 https://www.gov.uk/government/publications/tag-data-book
15 The DfT definition of a serious injury is (a) an injury for which a person is detained in hospital as an in-patient or (b) any of the following injuries (whether or not the person is detained in hospital): fractures, concussion, internal injuries, crushings, severe cuts and lacerations, severe general shock requiring treatment or (c) any injury causing death 30 or more days after the accident;
16 http://www.hse.gov.uk/Statistics/tables/ridhist.xlsx, http://www.hse.gov.uk/Statistics/lfs/lfsinjind.xlsx. The former (RIDDOR-based) is used for fatalities, the latter (based on the Labour Force Survey) - for injuries. The fatality rate is scaled up proportionally to also include fatal injuries to members of the public from construction.

Table VFA2. Valuation summary for workplace accidents and injuries

	Fatalities				Serious injuries				Slight injuries				
Year	Actual	Counter-factual	Unit value	**Total Value**	Actual	Counter-factual	Unit value	**Total Value**	Actual	Counter-factual	Unit value	**Total Value**	Total VFA value
2016	0	0.016	£1,889,415	**£30,436**	1	3.86	£212,318	**£607,827**	3	15.23	£16,368	**£200,219**	***£838,482***
2017	0	0.025	£1,899,080	**£47,959**	2	8.12	£213,404	**£1,305,286**	3	32.01	£16,451	**£477,199**	***£1,830,444***
2018	0	0.037	£1,904,693	**£70,877**	6	14.28	£214,035	**£1,771,533**	7	41.85	£16,500	**£575,070**	***£2,417,479***
2019	0	0.037	£1,910,733	**£70,479**	6	17.05	£214,713	**£2,372,412**	7	49.98	£16,552	**£711,417**	***£3,154,308***
2020	0	0.045	£1,917,294	**£86,032**	11	16.43	£215,451	**£1,170,536**	15	48.17	£16,609	**£550,982**	***£1,807,550***
2021	0	0.050	£1,925,361	**£96,087**	5	17.30	£216,357	**£2,661,106**	17	50.71	£16,679	**£562,316**	***£3,319,508***
2022	0	0.035	£1,933,674	**£68,077**	4.5	12.69	£217,291	**£1,783,446**	7.5	34.60	£16,751	**£453,457**	***£2,304,980***
2023	0	0.029	£1,942,228	**£56,197**	3.5	10.78	£218,252	**£1,579,459**	5.9	27.27	£16,825	**£358,877**	***£1,994,533***
2024	0	0.017	£1,952,087	**£33,449**	2.0	6.54	£219,360	**£996,638**	3.4	15.34	£16,911	**£202,734**	***£1,232,821***

To date Tideway has had a lower incident and injury rate compared to HSE published data for the construction sector. Tideway's record to date in preventing accidents can partly be attributed to rigorous health and safety training delivered as part of their EPIC (Employer's Project Induction Centre) scheme. Over 22,000 hours of workforce training were delivered in 2018 alone, and over 26,000 in 2019. The EPIC scheme covered 23,316 individuals and is the focus of one of the qualitative assessments.

VFA 3 - Reduction in lorry movements

The location of the tunnel - under the river Thames and with worksites along the banks of the river - creates an opportunity to use the Thames as a means of transportation for the construction works. Transporting construction materials and waste by river avoids the need to transport them by road using heavy goods vehicles (HGVs), which we associate with three socially desirable outcomes:

- Reduced road traffic congestion
- Reduced road traffic injuries and fatalities
- Reduced CO_2 emissions (beyond those counted in VFA 1)

The unit value of congestion is taken from the TAG Data Book, Table 5.4.2: 2020 Marginal External Costs and Indirect Tax of congestion for HGVs (pence per vehicle km, 2010 prices, 1 decimal point). They are adjusted to 2019 price levels. An adjustment based on the real GDP per capita index is also used to simulate the evolution of the value of congestion over the years.

Road traffic fatalities, serious injuries and slight injuries use the same DfT-based unit values as in VFA 2. CO_2 emissions use the same unit value (non-traded central estimate of the price of a tCO_2e) as in VFA 1.

The quantities for all three outcomes - actual and counterfactual - are derived from the same data source: the distance travelled by HGVs (in km) as part of the operations for the tunnel construction. The actual distance travelled is provided by Tideway. Also provided by Tideway is an estimate of the distance saved as a result of employing river transport. The counterfactual distance travelled by HGVs, which would be realised in the business-as-usual scenario where no river transport would be employed, is the sum of the actual distance travelled by HGVs and the estimate of the distance saved by employing river transport.

As the price of congestion is expressed in pence per km, the unit quantity for congestion is directly expressed in km of HGV trips (the difference between counterfactual and actual).

The quantity of fatalities, serious and slight injuries from road accidents associated with HGV movements (per km) is estimated from UK nationwide Road Accident Statistics (RAS)[17] published by DfT, as follows: The total number of people killed, seriously injured and slightly injured in accidents involving HGVs in the UK in the respective year is divided by the total HGV km travelled in the UK in the respective year. Future years' values are forecasted by linearly extrapolating trends from past years. This is then multiplied by additional Tideway HGV km avoided (i.e. counterfactual minus actual).

The quantity of GHG emissions associated with HGV movement is obtained by multiplying the km of HGV trips by the average GHG emissions for HGVs in kgCO2e/km from the UK Government GHG Conversion Factors for Company Reporting guidance developed by BEIS and DEFRA[18].

In addition to the reduction from less HGV movement, we also take into account the increase in GHG emissions owing to the increased river transport. The BEIS/DEFRA GHG Conversion Factors also report the general cargo ship average kgCO2e emissions per tonne*km, which we multiply by the average weight of the cargo ships employed on the Tideway tunnel construction sites - reported by Tideway as 1400 tonnes. This is multiplied by the km travelled by river, also provided by Tideway (actual data only; counterfactual is assumed to be 0 because the BAU scenario envisions all materials being transported by road). This value from increased river movement is a negative benefit (presented with a negative sign) due to the increased associated GHG emissions, as opposed to the positive benefit from the reduction in HGV movement.

While we acknowledge that potentially there are also increases in river congestion and in river accidents compared to the counterfactual, these are not valued due to insufficient data.

Table VFA3. Valuation summary for road (HGVs) and river transport

	Road		Congestion		Injuries and fatalities		GHG emissions		River - GHG emissions			
Year	km HGV trips	counterfactual km	Value per km	**Total value**	Value / km	**Total value**	Value / km	**Total value**	km river trips	Value / km	**Total value**	***Total VFA value***
2016	152,196	204,014	£0.446	**£23,091**	£0.028	**£1,432**	£0.062	**£3,211**	6,844	£1.233	**-£8,438**	***£19,296***
2017	1,028,179	1,828,816	£0.448	**£358,600**	£0.027	**£21,253**	£0.063	**£50,364**	27,940	£1.251	**-£34,964**	***£395,252***
2018	1,622,518	3,458,246	£0.449	**£824,640**	£0.026	**£47,416**	£0.064	**£117,219**	46,257	£1.270	**-£58,760**	***£930,515***
2019	1,977,856	14,193,109	£0.451	**£5,504,697**	£0.025	**£307,736**	£0.065	**£791,596**	185,697	£1.289	**-£239,396**	***£6,364,633***
2020	1,489,823	8,967,815	£0.452	**£3,381,463**	£0.025	**£184,157**	£0.066	**£491,917**	134,266	£1.309	**-£175,704**	***£3,881,833***
2021	1,842,570	4,456,509	£0.454	**£1,186,967**	£0.024	**£63,088**	£0.067	**£174,804**	43,433	£1.330	**-£57,781**	***£1,367,078***
2022	1,658,313	4,010,858	£0.456	**£1,072,883**	£0.024	**£55,745**	£0.068	**£159,915**	64,319	£1.352	**-£86,976**	***£1,201,567***
2023	1,492,482	3,609,772	£0.458	**£969,866**	£0.023	**£49,337**	£0.069	**£146,235**	50,784	£1.374	**-£69,776**	***£1,095,662***
2024	1,119,361	2,707,329	£0.460	**£731,092**	£0.023	**£36,463**	£0.070	**£111,426**	28,661	£1.396	**-£40,008**	***£838,973***

17 Table TRA3105 (total HGV distance travelled) and Table RAS40005 (casualties by vehicle type).
18 https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019

VFA 4 - Employment for the workless

One of the Legacy Programme commitments is to create employment opportunities for the workless (commitment 38). Being unemployed is known to be associated with lower personal wellbeing. In this sense, offering a job to an unemployed person can offer a significant boost to that person's wellbeing.

State of Life analysis using multivariate regressions on a large nationally representative UK household survey - Understanding Society[19] - has shown that having a full-time job is associated with 0.284 higher average life satisfaction on a 1-7 scale in comparison to being unemployed, after controlling for (holding constant) a range of demographic factors that are known to influence wellbeing. This is equivalent to 0.473 on the standard ONS 0-10 scale of life satisfaction (after scaling proportionally to the range of the scales, that is, multiplying by 10/6).

The Wellbeing Supplementary Guidance to the Green Book[20], released in July 2021, is the first government-issued guidance on Social CBA that recommends a fixed valuation rate for converting life satisfaction impacts into monetary equivalent values - namely £13,000 / WELLBY (With a lower bound of £10,000 and an upper value of £16,000; for simplicity we stick to the central rate). This is equivalent to saying that an increase in life satisfaction of 1 on a 0-10 scale affecting one person for one year is valued at £13,000 in 2019 price and average household income levels. We factor in some growth over time as household income rises, because this value is based on WTP (Willingness To Pay), which is affected by income.

Finally, we factor in a deadweight adjustment to account for the fact that in the counterfactual scenario, some of the Tideway employees previously workless would have found a job anyway. We use a deadweight estimate of 39.4% based on the Homes and Communities Agency (HCA) Additionality Guide[21], Table 3.2: Deadweight factors by type of intervention – BIS/CEA guidance. This results in a social value for each employee previously workless of £3,729 in 2019 (with a slight growth over time).

The respective unit quantity is the number of previously workless people employed, summed across Tideway and all three MWCs in any given year. This was provided to us by Tideway from its internal data collection tool, Data Warehouse. However, the respective data entry shows 'the number of job starts previously workless in the current period' but carries no information about how long these people worked with Tideway or the respective MWCs. Note that Tideway classifies 'sustainable employment' as at least 26 weeks, but the upper bound and average duration are not defined. We acknowledge this limitation and assume an average duration of employment of one year.

Note that we are only considering the wellbeing effect of new employment for the previously unemployed, but not the increased wage earnings of these new employees. This is because, in the counterfactual scenario, the workload and number of staff required for the tunnel construction is the same, and therefore total wage earnings are also the same - it is just that the people who were previously workless in the actual scenario are replaced by other workers who were not necessarily all previously unemployed.

19 https://www.understandingsociety.ac.uk/
20 Wellbeing Guidance for Appraisal
21 /additionality_guide_2014_full.pdf

Table VFA4. Valuation summary for employment of the workless

Year	Job starts previously workless	Wellbeing effect on life satisfaction	Deadweight adjustment	WELLBY change	Value / WELLBY	Value / job start	**Total Value**
2016	59	0.473	39.4%	16.92	£12,640	£3,626	**£213,921**
2017	86	0.473	39.4%	24.67	£12,803	£3,672	**£315,820**
2018	157	0.473	39.4%	45.03	£12,898	£3,700	**£580,825**
2019	290	0.473	39.4%	83.18	£13,000	£3,729	**£1,081,387**
2020	110	0.473	39.4%	31.55	£13,112	£3,761	**£413,711**
2021	172	0.473	39.4%	49.34	£13,250	£3,801	**£653,721**
2022	154.8	0.473	39.4%	44.40	£13,394	£3,842	**£594,720**
2023	139.3	0.473	39.4%	39.96	£13,542	£3,884	**£541,187**
2024	104.5	0.473	39.4%	29.97	£13,715	£3,934	**£411,061**

VFA 5 - Apprenticeships

Similarly to finding a job, getting an apprenticeship is a positive life event for a young person's wellbeing. It offers on-the-job training, improved career prospects, and a sense of doing something meaningful in life.

The same multivariate regression described in VFA4 above provides us with an estimate of the higher personal wellbeing (life satisfaction) associated with having an apprenticeship (as opposed to being unemployed) - 0.355 on a 1-7 scale. This is equivalent to 0.592 after linearly rescaling to the standard 0-10 scale. Having unemployment as the comparison group is sensible because this is a common alternative for young people working in construction. The magnitude of the effect is large - more than twice as big as that of being married or having a partner, and comparable to increasing one's subjective general health status from fair to good or from good to excellent.

We apply the same valuation methodology as described in VFA 4. However, we employ a higher deadweight adjustment of 80%. This is because employing apprentices is a Section 106 and DCO commitment that Tideway signed up to. Therefore in the counterfactual scenario, where the tunnel is built adhering to the minimum legal requirements, Tideway would still have had to employ 1 in 50 FTEs of apprentices for the construction work. Only the apprenticeships that are over and above this target can count towards the added benefits of the Legacy Programme (some MWCs employ as much as 1 in 30 FTEs, while others are closer to the minimum target). This deadweight adjustment is included in the unit value estimate (value per apprentice).

The respective unit quantity is the number of apprentices who have worked on the project for 12 weeks in the current workforce - average levels for the year in question. This was provided to us by Tideway from its internal data collection tool - Data Warehouse. Note that here the apprentice is counted for as long as they are in the workforce, which allows a more accurate estimation of the duration of the effects (actually it is slightly on the downside of the true duration because apprentices who worked for less than 12 weeks are discarded).

Table VFA5. Valuation summary for apprenticeships

Year	Apprentices on project for 12 weeks	Wellbeing effect on life satisfaction	Deadweight adjustment	WELLBY change	Value / WELLBY	Value / apprentice	**Total Value**
2015	1	0.592	80.0%	0.138	£12,505	£1,480	**£1,726**
2016	13	0.592	80.0%	1.568	£12,640	£1,496	**£19,819**
2017	30	0.592	80.0%	3.540	£12,803	£1,515	**£45,323**
2018	40	0.592	80.0%	4.684	£12,898	£1,526	**£60,412**
2019	57	0.592	80.0%	6.794	£13,000	£1,538	**£88,326**
2020	62	0.592	80.0%	7.287	£13,112	£1,552	**£95,551**
2021	61	0.592	80.0%	7.169	£13,250	£1,568	**£94,991**
2022	54.5	0.592	80.0%	6.452	£13,394	£1,585	**£86,418**
2023	49.1	0.592	80.0%	5.807	£13,542	£1,603	**£78,639**
2024	36.8	0.592	80.0%	4.355	£13,715	£1,623	**£59,731**

VFA 6 - Employing people with convictions

People with convictions often face a hard time re-entering the labour force because a large proportion of employers are less likely to hire them. A lack of stable employment and income, in turn, can encourage them to re-offend, thus creating a vicious circle with a significant negative impact on these people's wellbeing.

Offering a job to people with convictions can present an opportunity to acquire the stable earnings and sense of security associated with having a job. This increases their sense of purpose and fulfilment in life, their self-confidence, and makes them significantly less likely to commit a crime again.

The positive outcomes created by offering employment to people with convictions are numerous, enough to warrant an entire separate study. One such study has been performed by Social Value UK, who evaluate CleanStart[22], a programme of the Trafford Housing Trust that employs people with convictions.

The CleanStart programme offered jobs to 47 people with convictions and its total Social Value was estimated at £2,245,855. Of these, we subtract the £597,485 of value that corresponds to the salaries earned by the people with convictions working for CleanStart. This is because in our case, the counterfactual scenario contains the same amount of labour used for tunnel construction, with the sole exception that none of the employees are people with convictions (therefore any salary effects would cancel out). Furthermore, because the social value of CleanStart hinges upon the assumption that the benefits last for 1.5 years, we divide the resulting value by 1.5 to produce a yearly benefit. The social value estimate of employing 1 person with a conviction for one year is therefore £23,381 in 2014 pounds, which is further adjusted for household income growth for subsequent years and inflation to 2019 pounds.

22 https://socialvalueuk.org/wp-content/uploads/2016/03/Cleanstart%20SROI%20FINAL%20FOR%20WEBSITE.pdf

An SROI evaluation commissioned by Tideway and undertaken by a different consultant presented a value per person of £65,483 per person (almost three times higher), consisting of 4 components:

- Employment-related benefits - £31,847
- Reduced reoffending - £3,849
- Relief from drugs/alcohol - £19,988
- Increased wellbeing - £9,788

However, the present study has found this value to be an overstatement. The employment-related benefits contain some economic effects such as goods and services produced from the employment, which are no different from the counterfactual, when a person without convictions is employed instead. The costs of reduced crime are an average per incident rather than per person (and we would need to work out the average number of crimes committed by a prison leaver, which is not known), and similarly the relief from drugs/alcohol value is per treatment programme rather than per person (it would have to be divided by an average number of participants, which is also unknown). Only the wellbeing value is adequately framed. Therefore the present study chose to use the more conservative values from CleanStart.

The respective unit quantity is the number of people with convictions, recruited by Tideway and its MWCs through outreach programmes, in the current project workforce. This was provided to us by Tideway from its Data Warehouse using monthly figures. For this reason, yearly averages rather than totals are taken. This automatically accounts for the duration of impact in years, as a person with criminal convictions will be counted in the monthly data for as long as they are active in the workforce.

Finally, as in the previous two VFAs, we apply a deadweight adjustment to account for the fact that in the counterfactual scenario, some people with convictions would have found a job anyway. However, this percentage is quite low. According to a government press release, "many former offenders find it almost impossible to get a job with just 17% in P45 employment a year after release."[23] In line with this statement, our chosen deadweight is 17%.

Table VFA6. Valuation summary for employing people with convictions

Year	People with convictions employed in current workforce	Social value per person per year	Deadweight adjustment	**Total Value**
2015	1	£25,887	17%	**£19,696**
2016	6	£26,168	17%	**£121,267**
2017	16	£26,504	17%	**£340,974**
2018	17	£26,700	17%	**£385,975**
2019	16	£26,912	17%	**£355,536**
2020	15	£27,144	17%	**£330,434**
2021	9	£27,431	17%	**£214,392**
2022	8.5	£27,728	17%	**£195,043**
2023	7.6	£28,035	17%	**£177,486**
2024	5.7	£28,392	17%	**£134,810**

23 https://www.gov.uk/government/news/criminal-record-reform-to-support-ex-offenders-into-work

VFA 7 - Education and training for young people to pursue STEM careers

As part of their Legacy programme, Tideway is working with several charities to conduct activities that encourage school students to pursue careers in construction and engineering.

Simetrica in their social impact assessment of the Siemens Curiosity Project[24] produce an estimate of the net present lifetime value of determining one young person to pursue a STEM career by using the human capital approach (that is, calculating the net present value of 10 years of future earnings by using the differential between the mean salary of STEM graduates and graduates for all subjects for different levels of education, and then weighting these by the proportion of the respective levels of education among the UK population). The resulting social value estimate of determining a young person to pursue a STEM career is £5,230 in 2016 pounds, which is adjusted for household income growth and for inflation to 2019 pounds.

To work out the unit quantity - the number of STEM careers generated, we consider the volunteering activities undertaken by Tideway and the Main Works Contractors to promote STEM careers among schoolchildren. From the Community Investment and Education worksheets of MWC's and Tideway Legacy Reports we take the sum of the number of beneficiaries for all activities flagged as 'STEM.'

However, it is difficult to say how many of these young people will actually move on to successfully pursue a STEM career, mainly because this outcome won't be known until several years after the activity is completed. Therefore we need to make an assumption about the success rate - the proportion of these young people engaged that actually make a difference and go on to pursue a STEM career as a result of participating in these activities. Since the activities are mostly talks/seminars/workshops in schools, we use a relatively low success rate of 2%. The final number of STEM careers created is, in this sense, an estimate. Similarly to previous VFAs, we also apply a deadweight adjustment (33% in this case) to account for the fact that some of these young people would have gone on to pursue a STEM career anyway, even if the Tideway Legacy Programme were not in place.

Rather than using the general forecasting methodology, we were able to obtain more accurate estimates from Tideway staff on the planned intensity of STEM promotion activities for 2023 and 2024. These activities are tapering off faster than the main Tideway project.

Table VFA7.1. Valuation for STEM careers - MWCs activities and totals

Year	Young people took part	Success rates	Deadweight adjustment	Number of STEM careers	Value per person	**Total value**
2015	10542	2%	33%	141.26	£5,491	**£775,683**
2016	8983	2%	33%	120.37	£5,551	**£668,150**
2017	12651	2%	33%	169.52	£5,622	**£953,053**
2018	25977	2%	33%	348.09	£5,664	**£1,971,448**
2019	23937	2%	33%	320.75	£5,709	**£1,831,025**
2020	6069	2%	33%	81.32	£5,758	**£468,244**
2021	7139	2%	33%	95.66	£5,818	**£556,611**
2022	6425	2%	33%	86.10	£5,881	**£506,375**
2023	800	2%	33%	10.72	£5,947	**£63,749**
2024	400	2%	33%	5.36	£6,023	**£32,281**

24 unrestricted-social-impact-assessment-siemens-curiosity-project.pdf

In addition to this, we consider the number of young people engaged in the different kinds of activities undertaken by the Construction Youth Trust (CYT), shown in their 2018 and 2020 Annual Reports to Tideway. The year 2019 is interpolated as the average of 2018 and 2020. We assume a different success rate for each of the four activities organised by the CYT (see table below).

Table VFA7.2. Success rates and deadweight adjustment assumptions

Success rate - Young people engaged	1%
Success rate - Employer encounters	3%
Success rate - 'World of work' programmes	10%
Success rate - Coaching at-risk of NEET[25] Young People	25%
Deadweight adjustment - all CYT activities	90%

The deadweight adjustment of 90% is due to the fact that Tideway contributed only for about 10% of the CYT's total funding. Tideway's funding to the CYT in 2018 was £30,000, whereas the total funding of the CYT for 2018 was close to £300,000, according to the CYT 2018 Annual Report.

Table VFA7.3. Valuation for STEM careers - Construction Youth Trust activities

Year	Number of people that took part in activities				Number of engineering careers	Value per person	**Total value**
	Young people engaged	Employer encounters	'World of work' programmes	Coaching at-risk of NEET Young People			
2018	7000	3500	300		20.5	£5,664	**£116,104**
2019	4000	2200	208	28	13.4	£5,709	**£76,281**
2020	1000	900	115	55	6.2	£5,758	**£35,842**

Tideway's efforts to finance academies to develop tunnelling and wider river infrastructure skills are also worth mentioning as a contributor to this broader VFA of Education and Training. Tideway's Legacy commitments 20 and 25 mandate the establishment and support of two educational institutions - the Thames Skills Academy (TSA) and the Tunnelling and Underground Construction Academy (TUCA) - which have also played an important role in developing river, construction and engineering skills..

25 Not in Employment, Education or Training.

VFA 8 - London living wage

Costs of living in London are very high, and therefore the Living Wage Foundation estimated a wage rate that is sufficient to meet everyday needs[26] (for London and for the rest of the UK), which is higher than the national minimum wage (NMW) and national living wage (NLW) set by the UK government. Tideway and its MWCs have committed to pay the London living wage (LLW) to everyone working on the Tideway tunnel construction project, and have so far kept this commitment - there were a few isolated cases of a worker not being paid LLW, and these were quickly resolved.

The unit value in this case is very straightforward - it is equal to the difference between the LLW and the NLW set by the UK government for people aged 25 and above for the respective year. These extra wages represent increased income for the workers and therefore an increase in UK GDP for the periods in which they apply. The final values are adjusted for inflation to 2019 price levels. Rates for future years (2022 to 2024) are forecasts based on the average growth rates of the LLW and NLW respectively between 2015 and 2021.

The corresponding unit quantity is the sum of hours worked for Tideway and all three MWCs in the respective year. This is taken from the Tideway Data Warehouse as 'Number of total FTEs employed in current workforce' - the average value for the year in question - and multiplied by 52 weeks per year and the average number of hours per week worked in the construction sector, estimated at 41.2[27].

However, even outside Tideway, employees in London not being paid the LLW are in the minority. An article by the Trust for London references a statistic that 21% of employed London residents in 2017 earned less than the London Living Wage[28]. We therefore apply a deadweight adjustment of 79%, meaning that we assume these people would have found a job paying at least the LLW also in the counterfactual scenario, where Tideway had not adopted the legacy commitment to pay its workers the LLW.

Table VFA8. Valuation summary for the London Living Wage

Year	National living wage (over 25s) - nominal	London living wage - nominal	Number of total FTEs employed	Working hours per year	Deadweight adjustment	**Total value - adjusted to 2019 £**
2016	£7.20	£9.75	728.8	2142.4	79%	**£887,430**
2017	£7.50	£10.20	1531.4	2142.4	79%	**£1,937,717**
2018	£7.83	£10.55	1955.7	2142.4	79%	**£2,440,728**
2019	£8.21	£10.75	2335.5	2142.4	79%	**£2,668,917**
2020	£8.72	£10.85	2251.1	2142.4	79%	**£2,118,222**
2021	£8.91	£11.05	2369.8	2142.4	79%	**£2,198,098**
2022	£9.32	£11.35	1616.9	2142.4	79%	**£1,395,959**
2023	£9.75	£11.66	1276.6	2142.4	79%	**£1,016,910**
2024	£10.20	£11.98	720.5	2142.4	79%	**£522,487**

26 https://www.livingwage.org.uk/what-real-living-wage
27 https://www.building.co.uk/focus/should-we-work-all-hours/5039631.article
28 https://www.trustforlondon.org.uk/issues/work/london-living-wage/

VFA 9 - Volunteering

Volunteering is a great way not only to do some good to society, but also to raise the personal wellbeing of the volunteers themselves.

In line with the above, we use two measures of social value generated by volunteering. One of these relates to the wellbeing benefit to the volunteers themselves. State of Life team members Gramatki, Lawton and Watt (2020) published an academic paper[29] using multivariate regression analysis on longitudinal UK household data to estimate the increase in life satisfaction associated with volunteering in the last 12 months, and applied a wellbeing valuation technique to estimate its monetary value at £911 per person per year (reference year 2019). For other years we apply the household income growth adjustment, given that this value is pegged to UK median household income.

The corresponding unit quantity required for this outcome is the number of unique (distinct) individuals in any given year who engaged in Tideway-sponsored volunteering. This data is not directly available, because MWCs list the number of volunteers for each activity but do not record whether the volunteers from different activities are distinct. However, the Tideway Volunteer Report for 2019-20 allows us to estimate the ratio between the number of distinct people involved and the sum of the 'number of staff' allocated to all activities, which was around 54%. Therefore, we apply an adjustment of 54% to the sum of staff numbers involved in volunteering activities of Tideway and all MWCs to produce the number of distinct volunteers in any year.

The second measure relates to the benefit to society generated by Tideway-sponsored volunteering activities. However, the volunteering activities sponsored by Tideway, and therefore also the ensuing outcomes, were numerous and very diverse, and it would be impractical to quantify and assess them all. We therefore adopt a wage replacement approach and estimate the costs that would have been incurred if these volunteers were replaced by paid staff at the London living wage rate (adjusted for inflation to 2019 pounds). These costs are a lower bound assessment of the benefit generated to society (since someone in society would be willing to pay someone at the LLW rate or higher to perform these activities).

The corresponding unit quantity for this is the number of hours volunteered for all Community Investment and Education activities reported by Tideway and all three MWCs in the Legacy, Skills and Employment worksheets in the respective year.

We apply a deadweight adjustment of 27% to account for the fact that in the counterfactual scenario (without the Legacy Programme in place), some of these staff members would have still engaged in volunteering outside of Tideway.

29 https://link.springer.com/article/10.1007/s10902-020-00242-8

Table VFA9. Valuation summary for volunteering

Year	Number of volunteers	Wellbeing value per person per year	Hours volunteered	Price-adjusted London Living Wage (per hour)	Deadweight adjustment	Total wellbeing value	Total wage replacement value	**Total value of volunteering**
2015	89	£876	500	£10.19	27%	£56,932	£3,719	**£60,651**
2016	670	£886	4749	£10.35	27%	£433,246	£35,870	**£469,116**
2017	1369	£897	9066	£10.62	27%	£896,609	£70,312	**£966,921**
2018	1413	£904	10348	£10.76	27%	£932,279	£81,270	**£1,013,549**
2019	1349	£911	9976	£10.75	27%	£897,125	£78,283	**£975,408**
2020	659	£919	3643	£10.65	27%	£442,027	£28,333	**£470,359**
2021	693	£929	4184	£10.65	27%	£469,737	£32,514	**£502,252**
2022	623.7	£939	6073	£10.73	27%	£427,342	£47,558	**£474,899**
2023	561.3	£949	4795	£10.81	27%	£388,875	£37,826	**£426,701**
2024	421.0	£961	2706	£10.85	27%	£295,372	£21,440	**£316,812**

VFA 10 - Employing locally

It is worth noting that Tideway is making considerable efforts to employ locally. Legacy commitments 31-34 set percentage quotas for employees living in a) the local Borough of each drive site; b) the local Boroughs of each contract area; c) the 14 Boroughs affected by the tunnelling works; and d) Greater London, Kent or Essex. The resulting additional socioeconomic benefits include reduced commuting time (resulting in increased wellbeing and less pollution) and a greater sense of belonging to the community.

Aside from this, as the evaluation is conducted from a UK-wide perspective (as recommended by the Green Book), employing locally brings no economic benefits in the form of increased output or employment when compared to the counterfactual (where someone living farther away would have still had to do the same amount of work).

We make an attempt to quantify the wellbeing value of the reduced commuting time as a result of employing locally, although the unit quantities are a rough estimate based on a series of assumptions.

As a starting point we use the estimated total workforce on the entire Tideway project in any given year (as in VFA 8). Next, we assume that 25% of these are employed locally, given that different MWC's legacy reporting sheets show that between 20% and 30% of the total workforce are from the 14 London boroughs in the immediate vicinity of the tunnel. Furthermore, we apply a deadweight adjustment to consider the fact that in the absence of Legacy Programme commitments, a proportion of the workforce would have been employed locally anyway. With the absence of any specific evidence for this proportion, we use the generic deadweight value of 43% recommended for housing interventions by the Homes and Communities Agency in their Additionality Guide.

Finally, the corresponding unit value is £1,060 per person per year and is taken from the State of Life WELLBY Value Guide. It was derived using robust longitudinal wellbeing regression models on a massive dataset from 11 waves of Understanding Society data. This value is the monetary equivalent of the wellbeing difference associated with commuting to work for 1-2 hours as opposed to less than 15 minutes every day. Note that this is another rough assumption, as in reality no data has been collected on the average commuting times of Tideway workers both within and outside the 14 London Boroughs. Furthermore we assume 1 FTE = 1 person, where in reality 1 FTE may be composed of multiple people working part-time or in different periods of the year.

VFA 10. Reduced commuting time from employing locally

Year	Number of total FTEs employed in current workforce	Locally employed FTEs	Deadweight adjustment	Social value per person	Total value
2016	728.8	182.2	43%	£1,077	**£111,817**
2017	1531.4	382.9	43%	£1,083	**£236,353**
2018	1955.7	488.9	43%	£1,090	**£303,661**
2019	2335.5	583.9	43%	£1,096	**£364,739**
2020	2251.1	562.8	43%	£1,102	**£353,441**
2021	2369.8	592.5	43%	£1,107	**£373,972**
2022	1616.9	404.2	43%	£1,113	**£256,400**
2023	1276.6	319.2	43%	£1,118	**£203,394**
2024	720.5	180.1	43%	£1,123	**£115,316**

VFA 11 - River Reconnection Partnerships

Tideway has funded multiple community programmes to support volunteering and community initiatives that aim to help people reconnect with the River Thames as part of Legacy Commitment 45. Due to resource and practicality limitations, bespoke evaluations were only conducted for two of these programmes (which implies that the total social value of this VFA may be higher than stated here). The two programmes are Active Row and Thames River Watch, run by charities London Youth Rowing and Thames21 respectively. Tideway provided funding to these partner organisations to run the respective programmes.

An evaluation of the social benefits generated by each of these two programmes as a result of the improvement in participants' personal wellbeing has been undertaken. The partner organisations, London Youth Rowing and Thames21, agreed to facilitate collecting survey data of the respective programme participants and a control group of non-participants, which would enable measuring the impact of participation on wellbeing. This wellbeing impact can then be valued using the Green Book Wellbeing Supplementary Guidance recommended valuation rate of £13,000 / WELLBY, as in VFAs 4 and 5.

Below we present the results of this estimation and attempt to incorporate them into a social CBA calculation to work out the social return on Tideway's investment into these programmes.

Note that for the Thames River Watch programme these results are indicative. This is because of the limitations of the research design and its inability to ensure an accurate counterfactual, particularly because of the low sample in the survey (57), especially for the non-participant subgroup (only 8 respondents). However, to counter this there is strong evidence that volunteering and physical activity are good for you with analysis of huge data sets using the most advanced regression techniques[30].

Due to the validity concerns expressed above, we have applied strong discount rates to the wellbeing estimates of the Thames River Watch programme to be more conservative and avoid our bottom line results being strongly affected by an overstatement of this programme's impact. Only 10% of the estimated value of the Thames River Watch is included in the social cost-benefit analysis in this study. For the Active Row evaluation, sample sizes were considerably larger (over 500 respondents, evenly split between participants and non participants), and the results of the evaluation can be considered more robust. Therefore there is no need to apply similar discounting to the estimated value of Active Row.

Active Row

The Active Row programme aims to get school children to participate in rowing activities on the river Thames. It ran for 4 years - 2017/18, 2018/19, 2019/20 and 2021/22 (2020/21 being skipped due to COVID19), having about 2850 participants each year. Tideway funded a total of £404K towards the programme costs over the years, with the remaining £1.32M being funded by Sport England.

The survey shows that the average wellbeing associated with participating in school rowing is 0.466 life satisfaction points higher than for non-participants from the same schools. This is equivalent to a monetary wellbeing value of £6,000 per year per participant, and scaled up to the typical yearly number of participants, results in a benefit of over £17 million each year, or £69M over the 4 years.

However, given that Tideway is only responsible for 23.4% of the funding, we only allocate an equal proportion of the benefits to Tideway's contribution - just over £16 million, or £4 million for each of the 4 years in which the Active Row programme ran with Tideway's support.

Divided by the Tideway funding of £404K, this results in a benefit-cost ratio of 40.3 (£ of social value per each £ invested). Note that as a result of the proportional allocation of benefits, the BCR would be the same if we considered the whole programme and all its funding sources rather than just the Tideway contribution.

More details on the study will be shared by London Youth Rowing when they publish the Active Row social value study later in 2023.

30 Faith, Hoops and Charity (2021)

The Thames River Watch (TRW)

The Thames River Watch programme is a volunteering opportunity for people living in neighbourhoods close to the river Thames to participate in removing litter from the river and riverbeds and raising awareness about river pollution. It has been running for 7 years - between 2015 and 2021. It was also active in 2013-2014 and is planned to be extended until 2024, but Thames Water runs the sponsorship in 2013-14 and 2022-24, which is why we are excluding those years from the analysis.

Last year the TRW had 198 direct volunteers and an additional 150 volunteers from the river action groups. We therefore assume participation numbers of 350 participants each year. Tideway funded a total of £855K towards the programme costs between 2015 and 2021 and accounted for all or a vast majority of the funding. Tideway will fund an additional £80K in the future, although Thames Water will become the main funding source in the next three years. Other funding sources also contributed with £62K, meaning that Tideway's contribution is 93.8%.

The survey shows that the average wellbeing associated with participating in TRW is 0.824 life satisfaction points higher than for non-participants. This is equivalent to a monetary wellbeing value of £10,700 per year per participant, and scaled up to the typical yearly number of participants, results in a benefit of over £3.75 million each year, or £26.2M over 7 years. Of this, £24.6 million (£3.5M each year) is attributable to Tideway. More details can be found in the dedicated TRW wellbeing impact report[31].

Divided by the Tideway funding of £935K, this results in a total benefit-cost ratio of 26.3 (£ of social value per each £ invested) for the Tideway funding to TRW.

As mentioned earlier, we only consider and include in the main valuation framework 10% of these benefits - equivalent to £350K per year in the years 2015 to 2021 (this would imply a total BCR of 2.6, or 10% of the original value).

31 https://docs.google.com/document/d/11KMadrp_O15dclusLsiukr3KwrAaGWHYHrWHHAhgLb4/edit

2.4. Conclusion - Net benefit and BCR

Summing up the benefits of the 11 VFAs described above and comparing them to the estimated costs of the Legacy Programme, we get the picture outlined in the table below. The total values (except the benefit-cost ratio) are sums of the respective values for each year, with the exception that the values for 2023 and 2024 are discounted for time value of money using a discount rate of 3.5%.

Table CBA1. Total benefits and costs, net benefits and BCR of the Tideway Legacy Programme

Year	Total Benefits	Total Costs	**Net Benefit**	**Benefit-Cost Ratio**
2015	£1,190,454	£10,786,440	**-£9,595,986**	**0.11**
2016	£3,707,306	£6,680,436	**-£2,973,130**	**0.55**
2017	£7,658,805	£8,348,108	**-£689,303**	**0.92**
2018	£15,101,995	£9,388,885	**£5,713,110**	**1.61**
2019	£21,981,258	£8,768,468	**£13,212,790**	**2.51**
2020	£14,900,385	£3,181,802	**£11,718,583**	**4.68**
2021	£10,427,428	£2,932,900	**£7,494,528**	**3.56**
2022	£11,897,309	£2,580,587	**£9,316,722**	**4.61**
2023	£6,102,432	£2,193,018	**£3,909,413**	**2.78**
2024	£4,097,182	£1,607,824	**£2,489,358**	**2.55**
Total value	£96,585,773	£56,287,405	**£40,298,368**	**1.72**

This study concludes that the Tideway Legacy Programme (or at least its main constituent activities that were identified as delivering the largest quantifiable social impact) **delivers a net benefit of £40 million, and approximately £1.72 of social value for every £1 invested**.

Note that the social net benefit and BCR is unevenly spread across the years - a period of massive investment with little return gradually evolved into a period of steadily growing social benefits as investments decline, leading to the final years before the launch of this report having a considerably higher social return on investment (up to 4.68 in 2020). The final three construction years (2022 to 2024) use forecasted values and are not indicative of any possible patterns in the yearly BCR of the Legacy Programme in the remaining years (because the algorithm used for forecasting is generic rather than specific for each Legacy Programme output).

There could be multiple reasons for this evolution of the yearly SROI over time, but they boil down to two main possibilities:

1. Delayed returns on investment - this is actually very common for infrastructure projects. Such projects involve major expenditure at the beginning and get very little to no benefits until the project is up and running, and after that they reap all the benefits while incurring only much smaller maintenance costs. Although this normally applies to construction itself, it could be the case that the principle extends to the social / community investment side of the LP as well, and Tideway spent the bulk of their LP investment closer to the beginning while the LP benefits were more evenly spread out.

2. Measurement error in the cost data - this study is using the estimated costs from a 2018 SROI analysis, because Tideway considers them to remain representative. These cost figures span from 2015/16 to 2021/22, also being heavily concentrated in the early years. But the project timeline has shifted since that study and most likely so did the Legacy Programme costs. Unfortunately there is no way of knowing the nature of this shift - one could only assume. This study kept these costs intact and assumed extra costs for the uncovered years (2022-2024) through extrapolation, but in reality the timeline and amount of the actual Legacy Programme related expenditures (both in the original and extrapolated time period) might or might not be very different.

It is also curious to look at how the benefits of the Tideway Legacy Programme are spread across the different areas and identify which areas contribute the most. An overview is given in the table below. We can see that employment-related areas (providing job opportunities and apprenticeships) contribute less to the total benefits (most likely because of their relatively smaller scale). Accident prevention contributes the highest amount of social benefits (over 19% of the total), followed by the reconnection partnerships, reducing HGV movement by using the river for transportation, paying a fair wage and promoting STEM careers.

Table CBA2. Total benefits by VFA of the Tideway Legacy Programme

Area	Area name	Value	% of total benefits
VFA 1	Greenhouse gas emissions	£4,872,584	5.04%
VFA 2	Accident prevention	£18,750,688	19.41%
VFA 3	Taking lorries off the road	£16,001,976	16.57%
VFA 4	Employment of the workless	£4,760,720	4.93%
VFA 5	Apprenticeships	£624,307	0.65%
VFA 6	People with convictions	£2,260,649	2.34%
VFA 7	STEM careers	£8,050,543	8.34%
VFA 8	London Living Wage	£15,117,339	15.65%
VFA 9	Volunteering	£5,641,175	5.84%
VFA 10	Local employment	£2,304,547	2.39%
VFA 11	River Reconnection	£18,201,246	18.84%
Total Benefits		**£96,585,773**	**100.00%**
Total Costs		£56,287,405	
Net Benefit		**£40,298,368**	
Benefit-Cost Ratio		**1.72**	

2.5. Limitations

One must be cautious when interpreting the overall figures such as the total net benefit and BCR of the Tideway Legacy Programme. The figures for the programme costs and benefits by VFA above rely on unit quantity figures based on Tideway and MWC records. However, Tideway and the MWCs do not have a record-keeping system that pertains to the Legacy Programme in isolation, which would monitor total expenditure or most of the specific socially desirable outcomes identified in the VFAs.

Mostly, Legacy Programme monitoring was limited to the indicators defined as targets for the 54 Legacy commitments. Many of these do not relate to a specific, measurable and material social outcome. Multiple elements of the Social CBA in this study were therefore left with significant data gaps. State of Life and Tideway worked together to try to cover these the best we could. However, this study was commissioned after the project kicked off and all the data capture / reporting procedures were already in place and could not be changed. This means that our efforts to cover the data gaps were patchy and sometimes we had to fall back onto untested assumptions; this was the only way to finalise the Social CBA and calculate the final metrics, and there was no better evidence available to confirm or replace these assumptions.

In particular, the areas which rely the most on imprecise/untested assumptions and estimates are:

- Costs directly attributable to the Legacy Programme
- Employment outcomes (including apprenticeships etc.) attributable to the Legacy Programme
- STEM careers attributable to the Legacy Programme
- Volunteering, particularly wellbeing values
- Counterfactuals for GHG emissions

3. LESSONS LEARNED

This social value assessment of the Tideway Legacy Programme encountered significant challenges along the way because neither the Legacy Programme itself nor its monitoring and data capture frameworks were designed with evaluation and measurement of social impact in mind.

First, while the 54 legacy commitments are indeed tied to activities that result in social and economic flourishing (social value), the formulation of most of these commitments and the respective indicators is not conducive to accurate measurement. Some commitments are formulated as mission / value statements that do not involve any identifiable specific actions beyond those normally undertaken as part of the construction work (e.g. “Provide London’s essential Infrastructure through an enhanced sewerage system that supports growth”). Others consist of adopting processes or strategies where it is a priori unclear whether these will result in any final, socially valuable outcomes (e.g. “Introduce industry leading lorry and vulnerable road users initiatives”)

Second, crucial data, required to estimate the quantities of socially valuable outcomes generated by the Legacy Programme, was often missing. This is particularly true for the Legacy Programme costs, output quantities in the counterfactual scenario, and even some outputs in the actual scenario which are farther in the future (e.g. STEM careers). The Legacy Programme data capture system set up by Tideway was geared more narrowly towards tracking the fulfilment of the self-imposed objectives of the 54 commitments and not towards their broader implications for overall societal welfare.

These issues negatively affected the accuracy of the resulting social value estimates, because many of its constituent social benefits and costs relied too heavily on (often untested) last resort assumptions applied to fill in the remaining data gaps.

To avoid these difficulties in the future, we recommend keeping in mind the following considerations if Tideway (or other major infrastructure projects more generally) shall desire to undertake further social value assessments in the future:

1. Have a clear idea of what is to be evaluated and what should be left outside the scope of the exercise. Tideway has commissioned multiple social value studies in the past, covering various areas of its activity. Eventually it was decided after consultations that this study would aim to cover as much as possible of the Legacy Programme activities but not the core benefits of the tunnel. In an ideal situation the commissioning organisation should already have a reasonably well-shaped definition of what it wants to include in the assessment and what should be left out. It is also good to always think of the most appropriate counterfactual - the reference scenario one would like to compare against to prove one’s contribution. A different counterfactual may result in a radically different valuation. Having defined the scope and counterfactual, it is good to ensure that the intervention thus defined for the purpose of impact assessment exists as a separate reporting entity/category in the company’s data reporting systems (which, unfortunately, the Tideway Legacy Programme was not).

2. Define the programme/intervention to be valued in terms of specific, measurable and achievable (SMART) outcomes. Many organisations - public, private, and third-sector - speak a lot in terms of strategy and vision/value statements, which are often too vague to be connected to a specific outcome in order to assign social value. Always ask: “What changed? Who experienced this change? Is it possible to measure the quantity of the change (e.g. number of people affected)?” Think of how any group in society, which does not have to be part of the organisation, is affected.

3. Ensure that the social value of the indicators related to a particular objective can be easily proved. Lives saved, health improvements, wellbeing, jobs created, education, crime reduction, clean air are all universally agreed upon, quantifiable benefits to society. This is less true for receiving a certification, a rating, holding an induction seminar, engaging stakeholders and signing cooperation deals, public debate etc. One would have to prove that these led to one of the previously mentioned unambiguous, final outcomes and measure their extent in order to have a chance to perform valuation.

4. Set up a process for data collection / monitoring / reporting so that the unit quantity for these outcomes can be easily determined. Indicators should be framed in terms of raw numbers/amounts rather than ratios or percentages - the latter would have to be reverse-engineered anyway to link to the social value per person / per unit. Also, they should be as close as possible to the final outcome (e.g. “people who got a job” is better than “people who took a career seminar”). When dealing with wellbeing effects (volunteering, sport, church attendance, employment, marriage/relationships, and basically all regular or long-lasting activities that affect people), it is important to know the number of distinct people involved as well as the frequency and duration of participation. For example, Tideway focused on volunteering hours as its key measure and used to record the number of volunteers per event, and often it was the same people volunteering at different events, which made it very difficult to calculate an accurate total number of volunteers.

5. And finally, make a plan for social value assessment before you start the programme. Robust, high-quality evaluations can be performed when they are designed and the relevant data requirements are laid out before the core project starts. This way, data recording mechanisms can be adapted with the evaluation in mind and provide all the necessary inputs for a robust social impact estimation. If a social value analysis is commissioned when the intervention is either well underway or already finalised, the kind of data collected is already set in stone, and many components required to calculate benefits to society can be missing. This can turn the evaluation into a desperate attempt to “tie loose ends together” by compromising accuracy. In an ideal situation, the client would sit down with the social value expert before launching the programme and design a measurement framework in line with points 1-4 above, so that all the necessary data for an accurate impact assessment is collected.

As an ending note, Tideway’s Legacy Programme was first developed in 2014 and since then the sophistication of social value analysis has advanced. Tideway are aware that they would do some things differently if they were developing the programme today. The points set out above describe an ideal situation and, although they are definitely feasible, may set the bar too high in some cases for infrastructure projects developing their strategies today. After all, Tideway’s data management systems are defined by the needs and characteristics of the organisation’s core area of activity rather than social value measurement. Most evaluations will therefore be a compromise between the ‘gold standard’ of CBA according to HMT Green Book and the commissioning organisation’s internal capacity and willingness to commit extra resources to increase the validity and accuracy of the findings.

Tideway should be commended for the motivation and effort put in to ensure a high level of depth and rigour and produce robust social value analysis of their Legacy programme in the challenging circumstances dictated by the considerations above.

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