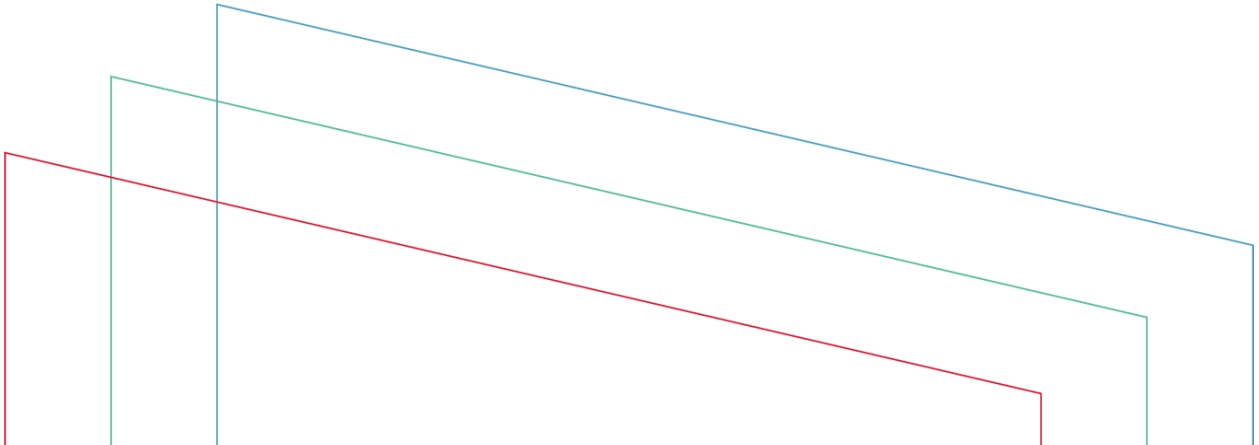
EXPANSION OF BRISTOL AIRPORT TO 12MPPA
PINS REF APP/D0121/W/20/3259234

PLANNING APPLICATION REF: 18/P/5118/OUT

PROOF OF EVIDENCE OF DR ALEX CHAPMAN

SOCIOECONOMIC IMPACTS ADDENDUM – UPDATED CARBON COSTS

New Economics Foundation



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1. INTRODUCTION

1.1.1. This addendum is submitted by Dr Alex Chapman PCAA witness on socioeconomics, and should be read alongside my Proof of Evidence (PCAA/W05/1) and Rebuttal (PCAA/W05/3).

1.1.2. On 2nd September 2021 the Department for Business, Energy & Industrial Strategy published a revised approach to valuing greenhouse gas (GHG) emissions in policy appraisal (INQ/054). This update was expected, having been foreshadowed by departments which expect to make use of these values, and is a direct consequence of the Climate Change Act 2008 (2050 Target Amendment) Order 2019.

1.1.3. This note aims to provide clarity on the implications of the UK Government's new carbon values for the assessment of costs and benefits and overall societal impact of the proposed expansion of Bristol Airport. This includes modelling new carbon costs based on the Government's new carbon values, establishing the proportion of this negative impact, and contrasting it with the claimed public and private benefits associated with the proposed scheme.

2. RELEVANCE TO THE INQUIRY

2.1.1. In their appeal documentation BAL and York Aviation have used BEIS carbon values as inputs to their forecast model, and to calculate the social cost of carbon in their socioeconomic cost benefit analysis.

2.1.2. The September BEIS policy paper (INQ/054) provides new, significantly higher, values for the monetisation of future emissions of greenhouse gases in appraisal. The carbon value per tonne in the assessment year of 2030 rises from £81 to £280, a factor of 3.5. This rise takes the Government's new 'Central' value, well above what was previously the 'High' value (£121 in 2030).

2.1.3. Consequently, both my previous modelling, and the Appellant's, are now out-of-date and unsuitable for decision making. Indeed, to base a decision on this modelling would expose UK society to significant climate risk.

2.1.4. I note that at various points, such as on page 35 of CD2.22 the Economic Impact Assessment Addendum, the Appellant's consultants *"argue strongly against the inclusion of the costs of carbon within the socio-economic cost benefit analysis"*. Such arguments fly directly in the face of a wide array of government policy and guidance documents, as I set out in my Proof of Evidence (PCAA/W05/1) and Rebuttal (PCAA/W05/3) using an array of quotes from official sources.

2.1.5. I would also note that since my previous submissions were written, BEIS has released further guidance on the *Valuation of Energy Use and Greenhouse Gas* in a July 2021 publication providing supplementary guidance to the Green Book.[1] This guidance sets out the context in which usage of the BEIS carbon values is appropriate and therefore I also refer to this document throughout this note.

[1] BEIS, July 2021, Valuation of Energy Use and Greenhouse Gas. Department for Business, Energy & Industrial Strategy

Critically, in this July 2021 guidance note, BEIS make explicitly clear that its approach to carbon valuation applies to planning decisions.

Paragraph 1.1. states:

"It is intended to aid the assessment of proposals that have a direct impact on energy use and supply and those with an indirect impact through planning"

Paragraph 2.7 states:

"*Analysts should ensure that all changes in energy use and UK GHG emissions factor in the interactions that policies and projects in one sector can have on other sectors. For instance, planning decisions may impact on transport emissions as well as emissions from buildings."*

This guidance is also absolutely clear that emissions should be monetised, stating (in direct contradiction of the positions put forward by York Aviation) in paragraph 3.29:

"Once the change in GHG emissions (measured in tCO2e) resulting from the project or policy proposal has been quantified using the methodology above, these emissions should be given a monetary value. It is important to value both the changes in emissions from fuel use, and also the changes in emissions from other sources."

2.1.6. Finally, both of the new documents also reiterate the Government's position that non-CO_2 effects and impacts overseas (i.e. including arriving flights) should be quantified. The policy paper (INQ/054) states:

"A policy or project that increases or decreases GHG emissions domestically or internationally relative to a "business as usual" scenario is required to quantify the change in emissions, and then apply the carbon values."

The July 2021 guidance note states:

"Where appropriate, proportionate and possible to identify the impact of the proposal on emissions overseas or that occur outside the target framework (e.g. radiative forcing from aviation), the change in emissions overseas should be valued…"

2.1.7. This is relevant because the Appellant has previously failed to quantify emissions associated with arriving flights, and non-CO_2 emissions. BEIS provide a simple method for the quantification of non-CO_2 emissions in their latest (June 2021) guidance on business greenhouse gas reporting. This guidance explicitly recommends the use of a 1.9x multiplier, as quoted below – though as I set out in my original proof, recent academic research suggests a higher, 3x multiplier, may be appropriate.

"Organisations should include the indirect effects of non-CO2 emissions when reporting air travel emissions to capture the full climate impact of their travel [...] To do this, it is recommended that a multiplier of 1.9 is applied to the CO2 component only of the direct emissions from aviation, and then summed with the CH4 and N2O direct emissions to calculate total kgCO2e (including direct and indirect effects)."[2]

2.1.8 Key messages:

- BEIS new carbon valuation guidance applies to planning applications and appeals
- Core scheme modelling and documentation must be updated with BEIS' new higher carbon values
- Non-CO_2 and international (i.e. arriving) emissions must be valued - something the appellant has so far failed to do

3. PRIOR FAILINGS IN CARBON MODELLING AND SENSITIVITY TESTING

3.1.1. The Appellant failed to adequately sensitivity test their original submissions. No sensitivity testing of the socio-economic assessment was conducted. This failure means the inquiry has less information on the relative sensitivities of the economic case and as such is inadequately prepared to handle the change in policy on carbon values we have now seen. This failure came despite clear guidance from the Department for Transport in 2020 that analysts should be sensitivity testing higher carbon values in preparation for this policy change.

3.1.2. The Appellant's poor and opaque approach to sensitivity testing of passenger forecasts also hampers our assessment in this regard. The Appellant failed to conduct an isolated test on its carbon values. The chosen approach of parcelling up carbon pricing with a wide range of other model inputs means we do not have adequate information on the sensitivity of the forecasts to carbon pricing. Indeed, the Appellant's inability or reluctance to describe precisely what input assumptions went into its faster and slower growth scenarios means we do not know if higher carbon prices have been tested in the forecasts at all.

3.1.3 Key messages:

- The appellant made an error of judgement in going against DfT advice and failing to sensitivity test the carbon values in their socioeconomic analysis
- Consistent failures in this regard undermine the quality and reliability for decision making of the analysis conducted by the Appellant

[2] BEIS (2021) Greenhouse gas reporting: conversion factors 2021

4. IMPLICATIONS OF THE POLICY CHANGE

4.1.1. The new carbon values are significantly higher than the old. The greatest increases in the annual value are seen in the short-term. The Central non-traded value in 2021 has risen from £70 to £245.

4.1.2. There is also a conceptual and semantic shift reinforced by INQ/054. It is emphasised that the BEIS carbon valuation method is a way of quantifying the *"monetary value that society places on one tonne of Carbon Dioxide Equivalent"*. This is clearly distinguished as being different from the 'carbon price' as represented by the price per tonne of carbon in the emissions trading market.

4.1.3. A critical point to note is that the price of a tonne of carbon on the traded market can vary from the true value of a tonne of carbon to society. Appraisal should first and foremost assess the societal value of carbon emitted by a project and weigh this against other scheme impacts. The market price of carbon simply informs decision makers of the relative proportion of the carbon value lost or created which will be internalised by the sector/business/consumer group paying the carbon fee.

4.1.4. At the time of writing, the market price of carbon (around £56 per tonne) was significantly lower than the government's carbon value for 2021 (£245 per tonne). This suggests that prices are not currently target-consistent and will need to change. It also implies that society will at some point in time incur an additional cost which is not currently internalised in the market, that is to say, the differential between the actual price (£245) and the price paid (£56). Conceptually this is likely to occur either through government or other stakeholders paying to capture carbon, or through the social costs incurred from missed targets and consequent climate damage.

4.1.5. INQ/054 address this issue, explaining that "additional measures" will likely be needed to be taken to bring the market in-line with national and international targets. Stating:

> *"it is likely that additional measures in the sectors covered by the UK ETS will need to be taken to reach net zero. Therefore, any emissions increases or savings resulting from policies (either traded or non-traded) should be considered and valued during appraisal. For emissions in the traded sector, appropriate adjustments should be made to account for any existing carbon pricing in the market prices of goods or services. For example, if a policy increases the production of a good where the price of that good already reflects a carbon price then this needs to be taken into account in order to avoid double counting some of the carbon costs."*

4.1.6. There are in fact a number of different carbon costs which are not currently 'internalised' in the market.

4.1.7. No costs associated with non-CO_2 climate impacts are captured by any of the existing carbon pricing schemes. As such these emissions are not internalised and the costs will ultimately be borne by wider society.

4.1.8. In PCAA/W05/1 I also described how a significant portion of ETS carbon allowances are given away to the aviation sector for free. These result in a lack of carbon price pass-through. I showed the effective subsidy the sector receives as a

result, the differential resulting from the difference between total sector carbon credits and those for which costs are passed through to consumers.

4.1.9. What INQ/054 makes clear is that, in addition to these giveaways, there is a further cost to society that results from the difference between the carbon values in a given year and the carbon price in that year.

4.1.10. In the section below, the new values set by the policy are used to re-cost the proposed expansion scheme's emissions impact. Internal and external costs are also disaggregated in order to allow decision makers to best understand impacts in this topic area.

4.1.11 Key messages:

- The principal objective of carbon costing has been reinforced by BEIS as measuring the value to society of emissions associated with an intervention
- Until future policy adjustments are made, market-traded carbon prices do not reflect the full cost to society of emissions
- The proportion of the total carbon cost which is internalised within a sector through carbon pricing can be noted in appraisal, but does not replace or eliminate the need to quantify the total carbon cost to society

5. RE-COSTED CARBON

5.1.1. In order to determine the new 'carbon cost' or marginal abatement cost the following methodology was used. The carbon emissions presented in the ES Addendum (CD 2.20.1) were extracted for each modelled year. Other years were linearly interpolated between these dates - it is recognised that this results in a slight variance with the full scheme totals as stated by the Appellant. However, in the absence of the full annual emissions tables, this simplifying assumption shouldn't create excessive variance. The period 2018-2077 has been used in order to allow for comparison with the figures presented in the ES Addendum. Future impacts are discounted at the standard Green Book rate.

5.1.2. In Table 1 I present the net additional emissions costs, considering the low, central and high carbon costs as well as the value with non-CO_2 emissions included (with multipliers of 1.9x and 3x), and with arriving flight emissions included. As discussed in my earlier submissions, use of a higher non-CO_2 effects multiplier represents a precautionary sensitivity test grounded in recent academic research indicating potentially higher climate impacts.

Table 1: Carbon Abatement Costs of Bristol Airport expansion, September 2021 carbon values.

2020 £, Net Present Value 2018-2077, to nearest £100k	**Low**	**Central**	**High**
Bristol Expansion	£284,700,000	£563,300,000	£845,400,000
Bristol Expansion + low non-CO_2 Factor (x1.9)	£549,500,000	£1,087,300,000	£1,631,962,083
Bristol Expansion + high non-CO_2 Factor (x3)	£878,900,000	£1,739,000,000	£2,610,200,000
Bristol Expansion + low non-CO_2 Factor (x1.9) + Arrivals	£1,099,000,000	£2,174,600,000	£3,263,900,000
Bristol Expansion + high non-CO_2 Factor (x3) + Arrivals	£1,757,700,000	£3,478,100,000	£5,220,300,000

5.1.3. Shown in Table 2 is the value of the domestically traded component of the carbon cost. As the UK ETS only covers departing flights, arrivals are excluded in these calculations. The UK ETS also currently makes no allowance for the non-CO_2 climate impacts of air travel so these are not included within the traded carbon calculation.

Table 2: Traded Carbon Costs of Bristol Airport expansion using BEIS traded-carbon values for appraisal

2020 £, Net Present Value 2018-2077, to nearest £100k	**Central**	**High**
Bristol Expansion	£312,000,000	£479,100,000

5.1.4. As I described in PCAA/W05/1, the costs shown in the table above can be split into those which are internalised with the aviation sector and those which are not. Over the period 2020-2080 our calculations based on current policy suggest around 20% of the carbon cost of the scheme which is internalised within aviation will actually be given away for free by government, or effectively subsidised. My estimate is shown in Table 3 as 'traded CO_2 not included in fares'. This represents the 'direct subsidy' and is sufficient to cancel out any increase in Air Passenger Duty take for central government.

5.1.5. Table 3 shows the different components of emission costs under current policy assumptions. The Central Prices and Central Values scenario shows, for example, that of a societal cost of over £2 billion, approximately 11.3% will appear in passenger fares, 14.6% is the unpriced abatement cost, including ETS subsidy, 24.1% comes from unaccounted non-CO_2 emissions associated with departures, and (due to the simplified methodology) 50% comes from considering arrivals (international emissions). A proportion of the value of the arriving flight emissions will also be captured, or 'internalised', by the EU ETS, but again, due to shortcomings in the scheme this will capture only a minority of the total value of emissions.

Table 3: Disaggregation of carbon costs across traded and non-traded categories.

2020 £, Net Present Value, millions	Traded CO_2 Included in fares	Traded CO_2 not included in fares	Unpriced Abatement Cost[3]	Lower non-CO_2 effects (x1.9)	Arrivals, CO_2 Price (EU ETS)	Arrivals CO_2e value (inc. lower non-CO_2 effects)	Total Unpriced Abatement Cost	Total CO_2 equivalent cost
Central Carbon Values and Prices	£245.2	£66.8	£251.2	£524.0	£312.0	£1,087.3	£1,550.5	£2,174.6
High Carbon Values and Prices	£378.4	£100.8	£366.3	£786.6	£479.2	£1,632.0	£2,305.7	£3,263.9

5.2. Construction and access emissions

5.2.1. In my prior submissions I did not prioritise analysis of the cost of the construction and surface access emissions of the proposed scheme. At that point the traded and non-traded carbon values in the short-term (i.e. 2021 to 2030) were in the range of £40 - £70. The large majority of construction and surface access emissions occur in this period. I judged that the resulting net carbon cost would be of relatively low value and therefore was not worthy of detailed interrogation.

5.2.2. However, the new carbon values published by BEIS range from £240 - £280 over the same short-term period, approximately quadrupling the cost per tonne. As a result, I have conducted analysis on the approximate net present value of construction and surface access emissions. My results are shown in Table 5.

5.2.3. My central estimate of the value of emissions from construction and surface access is £125m (Table 4). The equivalent figure from York Aviation appears to be £102m. I am not clear where the discrepancy arises between these two figures.

5.2.4. BAL have pledged to offset some of the costs associated with surface access emissions. It is not clear what price BAL expects to pay for these emissions. It is imperative that any such offsets are of the highest quality, and as such per-tonne prices akin to the values published by BEIS might be expected.

5.2.5. In any eventuality, the increase in the expected value of short-term carbon emissions will significantly reduce the net benefit of the proposed scheme. This will come as a result of (i) the cost of emissions, (ii) the reduced airport or airline profitability, or most likely, as a result of (iii) increased airfare costs paid by consumers.

5.2.6. A flaw in York Aviation's previous analysis can be seen between Figures 4.1 and 4.2 of CD2.22. When offsetting of emissions is introduced, reducing emissions costs by £43m, no corresponding reduction in passenger air fares or airport company benefits is seen. This missing reciprocal cost represents an error in the Appellant's

[3] In line with INQ/054, this is derived as follows: Abatement Cost - Traded Cost = Unpriced Abatement Cost. This doesn't include non-CO_2 or arrivals.

calculations. The same error can be seen in the updated versions of Figures 4.1. and 4.2 submitted in September 2021, in this case over £100m of carbon offsetting is included, apparently at zero cost to either passengers or the airport.

Table 4: Accounting for surface access and construction emissions.

2020 £, Net Present Value, millions, 2018-2077	Non-traded CO_2 Value	Additional Offset Commitment Estimated Price	Unpriced Abatement Cost
Surface Access: Central Carbon Value and Prices	£114.7	-£47.6	£67.1
Surface Access: High Carbon Value and Prices	£172.2	-£72.4	£99.7
Construction (valued as a pulse emission, 2024)	£10.7		£10.7

5.2.7 Key messages:

- The new BEIS carbon values significantly increase the overall carbon cost of the scheme across construction, access, departing, arriving, and non-CO_2 emissions
- The large majority of the emissions costs associated with the scheme are not internalised by carbon trading mechanisms and will be borne by wider society
- The appellant's pledges around carbon offsetting will do little to improve the benefit-cost profile of the scheme as the majority of any reductions in emissions costs will be offset by reductions in airfare and airport company savings

6. Socio-economic Cost Benefit Analysis

6.1. Background

6.1.1. The Appellant has presented an assessment of the socio-economic cost-benefit or 'welfare' impact of the scheme, distinct from the GVA assessment. These are presented on pages 36 and 37 of CD2.22 and updated versions have also been submitted following the release of new carbon values.

6.1.2. The various concerns about this analysis I presented in my Proof (PCAA/W05/1) still stand. This includes key concerns around reciprocal costs and benefits, and use of an incorrect discount rate, which overstate the scheme's relative attractiveness. Nonetheless I have updated the emissions costs figures in this analysis to get an idea of the sensitivity of the scheme to the carbon assumptions.

6.2. Benefit-cost analysis

6.2.1. As shown in Table 5, with application of the new emissions abatement values for the societal cost of carbon and the BEIS standard multiplier for accounting for non-CO_2 effects, the claimed benefits of the scheme are effectively wiped out. When factoring in arriving flight emissions, as advised by BEIS in its valuation guidance (see quote above), the overall benefit-cost profile of the scheme turns deeply negative.

Table 5: Benefit-Cost Analysis, net value to society using new BEIS marginal abatement costs

2020 £, Net Present Value, millions	Claimed benefits less direct construction costs	Carbon cost of construction and surface access	Carbon cost of departures assuming low non-CO_2 Factor (x1.9)	Carbon cost of departures assuming low non-CO_2 Factor (x1.9) and arrival emissions
Central	£1,125.0	-£125.40	-£1,087.3	-£2,174.6
High	£1,125.0	-£182.90	-£1,632.0	-£3,263.9

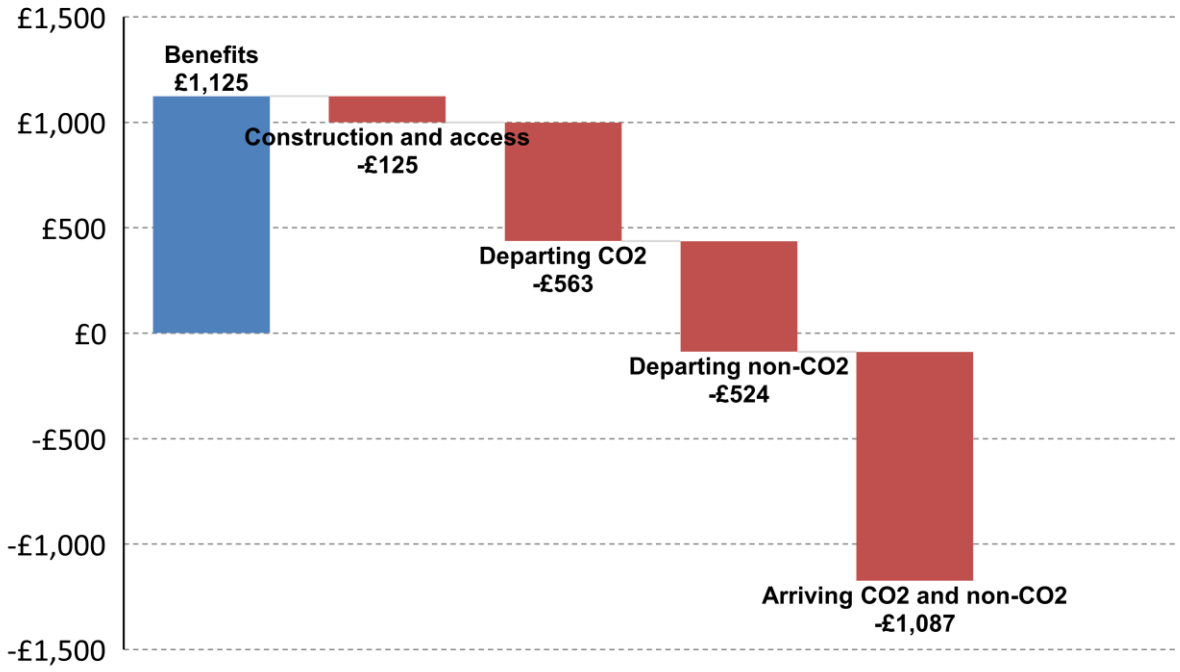
6.2.2. BEIS and DfT recommend analysts present decision makers with information regarding the breakdown of emissions costs which are internalised and externalised within the sector or market in question. In Table 6 I present the scheme benefit-cost analysis excluding those emissions costs which might be considered to be internalised within the market via the current UK ETS policy structures. The overall impact profile of the scheme remains highly negative.

Table 6: Benefit-Cost Analysis disaggregated by cost category, internalised costs excluded

2020 £, Net Present Value, millions	Claimed benefits less direct construction costs	ETS Carbon Subsidy	Unpriced Abatement Cost	Lower non-CO2 effects value (x1.9)	Arrivals (inc. lower non-CO2 effects)
Central	£1,125.0	-£66.8	-£251.2	-£524.0	-£1,087.3
High	£1,125.0	-£100.8	-£366.3	-£786.6	-£1,632.0

6.2.3. In Figure 1 I have redrawn the Appellant's cost and benefit chart to appropriately account for the range of different climate impacts of the scheme using the new BEIS 'central' carbon values.

Figure 1: Scheme benefits (less direct construction costs) against emissions costs as net present value (£millions), new central carbon abatement values



6.2.4. The discrepancy between my central departing CO_2 cost (£563m) and York Aviation's cost (£521m) I believe arises predominantly due to York Aviation's use of a single 3.5% discount rate, instead of the stepped 3.5% then 3.0% rate which I have applied and which is recommended in the Green Book.

6.2.5. If carbon offsetting of construction and access emissions were applied to Figure 1, there would be minimal change, as the removal of £125m of emissions costs would be offset by a decline in the scheme benefits of a similar magnitude.

6.2.6. In Figure 2 I have redrawn the Appellant's cost and benefit chart using the new BEIS 'high' carbon values. This represents a sensitivity test, and is clearly justified as a precautionary measure given recent upwards revisions of carbon values.

6.2.7 Key messages:

- The increase in the scheme's carbon costs resulting from the new BEIS carbon 'central' values means that the scheme's overall benefit-cost profile is deeply negative
- The net negative impact of the scheme grows further still when the new BEIS 'high' carbon values are applied

Figure 2: Scheme benefits (less direct construction costs) against emissions costs as net present value (£millions), new high carbon abatement values