The Scottish Parliament
Pàrlamaid na h-Alba

TRANSPORT, INFRASTRUCTURE AND CLIMATE CHANGE COMMITTEE

AGENDA

21st Meeting, 2009 (Session 3)

Tuesday 29 September 2009

The Committee will meet at 3.00 pm in Committee Room 1.

1. **Decision on taking business in private:** The Committee will decide whether to take item 3 in private.

2. **Draft Budget Scrutiny 2010-11:** The Committee will take evidence on the Scottish Government's Draft Budget 2010-11 from—

   Professor Jan Bebbington, Director, St Andrews Sustainability Institute, Vice-Chair (Scotland) Sustainable Development Commission, St Andrews University;

   Professor Stuart MacPherson, Chair, Irons Foulner Consulting Engineers;

   Professor Susan Roaf, School of the Built Environment, Heriot-Watt University;

   Dr Thomas Wiedmann, Director, Centre for Sustainability Accounting (CenSA) Ltd.

3. **Inquiry into active travel and sustainable transport:** The Committee will consider its approach to the inquiry.

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The papers for this meeting are as follows—

Agenda item 2

Carbon Assessment report of the 2010-11 Draft Budget

Private paper TIC/S3/09/21/1 (P)

Agenda item 3

Active travel/sustainable transport approach paper TIC/S3/09/21/2 (P)

CARBON ASSESSMENT OF THE 2010-11 DRAFT BUDGET

Table of Contents

Foreword **2**

1. Introduction **3**

1.1. Scope of assessment 3

1.2. Key results 4

1.3. Budget context 4

1.4. Climate Change (Scotland) Act and the high-level carbon assessment 6

1.5. Overview of the high-level carbon assessment 7

2. High-level carbon assessment of 2010-11 Draft Budget **10**

2.1. Method 10

2.2. Portfolio expenditure and associated emissions 11

2.3. Emissions by industry source 14

2.4. Direct, indirect, induced, domestic and imported emissions 15

2.5. Individual-level assessments (Carbon appraisals) 18

2.6. Carbon assessments and uses 19

3. Next Steps **21**

Annex 1 - Glossary **22**

Annex 2 - High-level Assessment of 2010-11 Budget – Details **24**

Annex 3 - Carbon assessment project **31**

High-level assessment 31

Individual-level assessment 32

Annex 4 - Methodology for High-level Carbon Assessment **33**

Input-Output model 33

Environmental Input-Output model 33

Emission impact of Government spending 36

Treatment of specific Budget items 36

Data availability and methodological challenges 38

Foreword

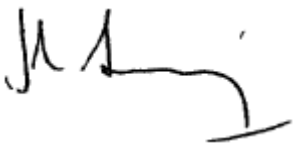
With the passing of the Climate Change (Scotland) Act 2009 and publication of its associated Delivery Plan, Scotland now stands at the forefront on climate change.

Meeting the challenging targets set by the Act will require a better understanding of the carbon implications of Government activity – of its estate, its expenditure and its policies. To enhance our understanding of these implications, we have been pursuing ambitious work to develop a methodology for assessing the carbon impact of the Government's Budget, in line with my commitments to Parliament. This is new and innovative work which we have taken forward with the support of independent consultants and with input from a range of external experts.

The carbon assessment of the Draft Budget has proved to be a complex and challenging task: the technical nature of this report highlights some of the difficult methodological and data issues that have needed to be considered. Despite these challenges we have managed to develop a tool that draws on three well-developed data sources and systems to undertake a high-level assessment of the carbon impact of the Scottish Government's Budget. Based on this methodology, I am pleased to now publish this first, high-level carbon assessment of a Government Budget alongside the 2010-11 Draft Budget.

This assessment provides, for the very first time, an assessment of the overall carbon impact of the Government's proposed expenditure. Undoubtedly, as with any new and ground-breaking approach, further work will be required to refine the methodology and develop the functionality of the tool. It is also important to emphasise that the high-level assessment is but one tool for estimating the carbon implications of the Government's activities. It has its limitations. To obtain a more balanced and complete picture of carbon impact, other tools (currently in development) will be needed to complement the high-level assessment. For example, carbon appraisal of individual policy measures and specific spending lines will be needed to better understand the carbon implications of individual strands of Government activity, including, importantly, their abatement potential - which is not captured in this high-level assessment. And clearly carbon costs need to be weighed against other objectives that spending programmes are intended to deliver.

I do not believe, therefore, that this report – and the methodology it describes – will be the final word in assessing the carbon consequences of the Budget. But it is a good and valuable first step. It will form part of an important discussion taking place across our nation about the carbon implications of activity across the economy and across society and how Scotland can best deliver the ambitious emissions reduction targets set by the Climate Change (Scotland) Act.



John Swinney, MSP

Cabinet Secretary for Finance and Sustainable Growth

1. Introduction

1. The assessment presented in this report provides a high-level understanding of the impact of Scottish Budget expenditure on global greenhouse gas emissions based on the expenditure data presented in the 2010-11 Draft Budget. In future years this assessment will be a statutory requirement under the Climate Change (Scotland) Act 2009. Recognising the importance of assessing the carbon[1] impact of Budget spending, policies and regulation as the basis for effectively reducing greenhouse gas emissions, the Government established a comprehensive Carbon Assessment Project.[2]
2. The Carbon Assessment Project comprises two main strands of work:
   - the development of a methodology for providing a high-level assessment (HLA) of the carbon impact of total Government spend;
   - the refinement and implementation of methodologies to assess the carbon impact of individual policies and projects (individual-level assessment, or ILA).
3. This paper reports on the first element of the Project – the high-level assessment. It also outlines, in Section 2.5, the role of individual-level assessment (or 'carbon appraisal') in helping better understand the carbon impact of Government activity. Finally, Section 3 sets out further work that might potentially be undertaken to develop these assessment methodologies.
4. The carbon assessment of the Budget provides, for the first time, an understanding of the carbon impact of Government spend. The Scottish Government is not aware of similar work being undertaken by any other government. As such, the assessment treads uncharted territory and should be seen as a first, significant, and to some extent experimental, step towards recognising carbon implications in the Budget process.

1.1. Scope of assessment

5. This assessment of the Draft Budget looks solely at the emissions associated with the purchasing of goods and services. 'Second-round' emissions impacts that may result from Government spending, whether beneficial in terms of reducing emissions (e.g. from spending on energy efficiency or afforestation) or negative in terms of increasing emissions (e.g. road use) are not captured. This means that any benefits resulting from Government investment in measures such as promoting home insulation are not recorded. The reasons for adopting this approach within the high-level framework are detailed in Section 1.5.
6. In order to better understand the emissions associated with the use of the public goods and services provided, this assessment needs to be linked to complementary work performed at the level of individual policies and plans (see Section 2.5). Capturing potential savings or additional emissions resulting from

[1] 'Carbon' is used as shorthand for climate-relevant greenhouse gas emissions, which are customarily expressed in CO_2-equivalents.

[2] See Annex 3 for further details.

investment is more readily assessed during the development of policies and plans, using methods described in Section 2.5. Adopting such a 'twin track' approach to assessing the impacts of spending permits the fullest picture of the impacts of Government investment to be obtained.

1.2. Key results

7. In the first instance, the high-level assessment (HLA) of the Budget gives an overview of the emissions relating to the goods and services Government buys. It is a consumption-based measure, i.e. it not only looks at the direct emissions (such as fuel for heating buildings) but also at the indirect (through the use of electricity) and imported emissions that are generated in the production of Government goods and services.

8. Following this approach, it is estimated that total emissions attributed to the Draft Budget amount to 11.5 million tonnes (Mt) CO_2-equivalent, compared to a total carbon footprint for Scotland as a whole in 2004 of 85 Mt CO_2-equivalent.[3]

9. The assessment also indicates that emissions impact of Government spending can be traced back to similar sources (e.g. electricity production). As a result, the carbon intensity of spending across portfolios is very similar. Therefore, reprofiling spending across portfolios would not greatly change the overall emissions attributable to the Draft Budget.

10. Details on the various sources of emissions indicate that about 34 per cent of domestic emissions attributable to Government spending originate from energy use. Knowing where the largest emissions occur is important in determining what action to take. For example, policy measures on electricity generation may have a direct impact on the emissions that are attributable to the Scottish Budget in future years.

1.3. Budget context

11. The Draft Budget for 2010-11 contains details of Total Managed Expenditure (TME) of £35 billion. The Draft Budget is split across the Government's six spending portfolios with spending on local government, administration and the Crown Office shown separately. Expenditure is analysed between resource and capital expenditure within the Departmental Expenditure Limit and Annually Managed Expenditure. This is illustrated in the following table.

[3] http://www.sei.se/mediamanager/documents/Publications/Future/scotland_policybrief_emissions.pdf

Table 1: 2010-11 Draft Budget

Portfolio	DEL			AME & Other	Total
	Revised Resource £m	Revised Capital £m	Revised Total £m	£m	£m
The First Minister	266.6	28.3	294.9		294.9
Finance and Sustainable Growth	1,768.8	949.3	2,718.1	3,165.4	5,883.5
Health and Wellbeing	10,960.4	873.9	11,834.3	55.0	11,889.3
Education and Lifelong Learning	2,505.9	211.0	2,716.9	135.0	2,851.9
Justice	1,036.0	179.0	1,215.0		1,215.0
Rural Affairs and the Environment	559.0	69.6	628.6		628.6
Administration	252.2	10.0	262.2		262.2
Crown Office and Procurator Fiscal	112.0	7.2	119.2		119.2
Local Government	8,938.8	870.2	9,809.0	2,076.3	11,885.3
Scottish Government	**26,399.7**	**3,198.5**	**29,598.2**	**5,431.7**	**35,029.9**
Scottish Parliament and Audit Scotland	111.2	3.0	114.2		114.2
Total	**26,510.9**	**3,201.5**	**29,712.4**	**5,431.7**	**35,144.1**

12. The Draft Budget for 2010-11 is over £700m less than initially planned as last set out in the 2009-10 Draft Budget document published in September 2008.

13. Since that time we have seen a significant reduction in the resources we expected to have available to us as a result of decisions taken by the Westminster Government. The Chancellor, as part of his UK budget announcement in April 2009, confirmed that spending decisions by the Westminster Government would result in a decrease in the Scottish budget for 2010-11 by approximately £500m.

14. In addition, action taken to accelerate capital expenditure resulted in spending of £53m in 2008-09 and £294m in 2009-10 being brought forward to provide a much-needed boost to our construction industry. However, that money is no longer available in 2010-11 and the capital budget has been decreased by £347m accordingly.

15. We intend to mitigate some of the impact of these reductions by taking up the offer by HM Treasury to drawdown a further £129m in EYF, over and above that agreed as part of the CSR07 settlement.

16. Approximately £2 billion of the 2010-11 Draft Budget is in respect of non-cash items such as capital charges, depreciation and local authority supported borrowing which are not included in the carbon assessment (for details see Annex 4). Therefore the carbon assessment is based on a total budget of £35.1 billion less £2 billion giving a total of £33.1 billion.

1.4. Climate Change (Scotland) Act and the high-level carbon assessment

17. The Climate Change (Scotland) Act, which received Royal Assent on 4 August 2009, has significantly changed the context for all climate change actions within Scotland – including carbon assessment. These are the key elements of the Act:

    - Setting targets: The Act requires that emissions of greenhouse gases be reduced by at least 80 per cent by 2050 compared to the 1990 baseline[4] and includes an interim target to reduce emissions by at least 42 per cent by 2020, with a power for this to be varied based on expert advice from the UK Committee on Climate Change or another designated 'relevant body'. Annual targets must be set in secondary legislation, with the first batch, for 2010-22 to be set by 1 June 2010. From 2020 onwards, annual targets must deliver at least 3 per cent per annum reductions.

    - Setting out how targets will be met: Shortly after annual targets are set a Report on Proposals and Policies must be laid in Parliament setting out the means to achieve those targets. The first of these detailed reports will be in the summer of 2010. At least 80 per cent of annual emissions reductions must come from "domestic effort", i.e. from within Scotland rather than through the purchase of carbon permits.

    - Reporting on progress: The Act requires to be published annually: a statement of net emissions and whether relevant annual target has been met; a report on progress from the advisory body; a Ministerial response to that report on progress; and a report on emissions attributable to Scotland's consumption of goods and services.

    - Action on adaptation to climate change impacts: An adaptation programme must be laid before Parliament as soon as possible after the publication of the statutory UK report on the impacts of climate change. These reports will be made at least every five years. The Act also requires that, within two years of laying a report, the Scottish Ministers request a report on progress from the Committee on Climate Change.

18. The Act also places this Budget carbon assessment on a statutory footing, requiring the Scottish Government to produce a report describing the direct and indirect impact on greenhouse gas emissions of its expenditure plans that adds to the range of data and information required for the Scottish Parliament to make informed decisions.

19. The Climate Change Delivery Plan[5], published in June identifies the key sectors for emissions abatement together with the high-level measures required in each sector in order to deliver the 2020 target and begin the changes required to pave the way towards the 2050 target. The Climate Change Delivery Plan is the precursor to the first Report on Proposals and Policies referred to above.

[4] 1990 for CO_2, CH_4, N_2O; 1995 for F-gases.

[5] http://www.scotland.gov.uk/Resource/Doc/276273/0082934.pdf

1.5. Overview of the high-level carbon assessment

20. A range of experts acknowledged in evidence to the Transport, Infrastructure and Climate Change Committee[6] that the carbon assessment of spend is a complex process and that there is no single recognised methodology. Recognising the challenging nature of the task, the Scottish Government engaged consultants to help look at options. This included convening an expert workshop at the end of November 2008 to discuss the merits and limitations of different methodologies, and identify the most appropriate way forward.

21. Having considered a number of possibilities, Environmental Input-Output (E-IO) analysis was identified as providing the best option to provide a HLA of the impact of Government spending on emissions. This methodology is similar to that used for calculating the carbon footprint of Scotland as a whole.[7] It takes into consideration not only direct emissions (e.g. fuel used by Government itself for space heating purposes) and indirect emissions of energy use (e.g. fuel combusted in power plants to supply the electricity used by Government) but also indirect emissions embodied in all goods and services that are funded by the Budget. It provides a 'consumption-based' estimate of total emissions relating to Budget expenditure.

22. Importantly, however, the assessment does not take account of the carbon emissions or savings that arise as a consequence of the provision of public goods and services. By way of example, while the emissions associated with manufacturing and installing insulation are recognised in the model it does not count the carbon which may be saved in the future as a result of making that improvement to the housing stock, although reductions in household energy usage will be captured in subsequent analyses when the carbon intensity of the household sector reduces.

23. There is one core reason why these 'second-round' effects are not captured within the analysis: the model calculates the outputs that result from the spend but not all of the outcomes that arise as a result of spending. Additional spending on, for example, motorway projects can be appraised for its carbon impacts in a relatively straightforward manner. However, the continuation of existing spending on, for example, road maintenance will also have carbon consequences; but what share of total road traffic emissions would be attributed to the fact that road surfaces are being maintained?

24. Including the emissions that arise as a *consequence of the use* of public goods and services can thus only be partially accomplished. While these effects are central to the development of policy, capturing them within this Budget assessment tool would have led to inconsistencies in the analysis and invalidated the use of the assessment because the consequential emissions could not be captured for all spending lines and, consequently, the emission figures would not be comparable.

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[6] On 28 October 2008 (http://www.scottish.parliament.uk/s3/committees/ticc/or-08/tr08-1902.htm#Col883).

[7] The carbon footprint is a major part of the 'ecological footprint' which is a National Performance Indicator (http://www.scotland.gov.uk/About/scotPerforms/indicators/ecologicalFootprint).

25. While other assessment processes are capable of accounting for use impacts the HLA process has the significant advantage over other tools of being able to calculate a consumption-based estimate. The UK Greenhouse Gas Inventory accounts for changes in overall use but is a domestic, production-based estimate.

26. It is possible to complement the outputs from the HLA with additional information from individual-level assessments or carbon appraisals to provide a fuller understanding of the carbon costs of public-sector activity. The Scottish Government has at its disposal guidance and tools to assess the impact of specific policy measures and address some of the limitations of the high-level assessment (see Section 2.5 for further details).

27. The HLA methodology is not suitable for setting annual targets for portfolios or public-sector bodies because the estimates produced through E-IO are unresponsive to short-term changes in public-sector policies, like green procurement. The analysis is based on industry averages. Only as the carbon intensities of the different industries reduce – through, for example, decarbonising the energy supply - will the carbon impact of spending be driven down. The HLA is a static analysis and does not model changes in behaviour brought about by policy measures. This report relies on 2006 data for average carbon intensity per industry and on the IO relationships from the year 2004. This is the latest information available but it means that the analysis is unable to reflect current developments.

28. The methodology for the carbon assessment of the Budget is high level in nature, and thus best applied to portfolio spending and Budget expenditure as a whole.[8] The assessment allows the Scottish Government to place the carbon impact of its use of goods and services within the wider context of the national and global economy. It helps raise awareness of the carbon impact of spend in different areas (by identifying the carbon emissions from upstream inputs, such as the production of gravel for road construction, as well as those generated directly, e.g. for space heating, by government expenditure). By attributing the 'carbon content' of spending to the originating industry (energy or transport) it confirms the key targets for carbon abatement.

[8] For more detail on the suitability of this assessment for different uses see Section 2.6.

KEY POINTS

The carbon assessment of the Budget provides a first attempt to understand the carbon impact of the goods and services purchased through Government spending.

It is estimated that total emissions resulting from the 2010-11 Draft Budget will be 11.5 Mt CO_2-equivalent. For comparison, this would be around 14 per cent of the estimated carbon footprint for Scotland as a whole, based on a 2004 estimate.

Over time, reductions in the emissions intensity of the economy as a whole will drive down the estimated carbon impact of future budgets.

This assessment indicates that the amount of carbon for each pound of expenditure across the different areas of Government spending does not vary greatly.

Emissions that may result from the *use* of public goods and services, whether beneficial in terms of reducing emissions (e.g. spending on energy efficiency or afforestation) or negative in terms of increasing emissions (e.g. road use) are not captured.

It is anticipated that methods for assessing the carbon impact of the Budget will continue to be developed alongside other assessment methods to improve understanding of the emission impacts of both Government expenditure and policies.

2. High-level carbon assessment of 2010-11 Draft Budget

29. The carbon assessment of the Budget takes into account the inter-industry relationships of the Scottish economy and the carbon intensity of production in the different sectors. Portfolio and industry analyses help us understand the impacts and sources of expenditure-related emissions.

30. The following sections provide a description of the method and portfolio-level results. Results for individual spending lines are presented in Annex 2.

2.1. Method

31. For this assessment, the Input-Output model estimates all changes in industrial production required to meet the final demands for goods and services as a result of central Government spending as planned in the Draft Budget. The Input-Output (IO) model takes into account the inter-industry relations of an economy and quantifies the effect of changes in one sector on all others. In this way it is possible to estimate all of the production changes that take place in response to output changes required to meet Government spending. For example, spending on "Motorways & Trunk Roads Structural Repairs" is associated with the outputs of the construction industry, which requires as inputs the use of fuel oil, machinery, raw materials and consumption of electricity.

32. The lowest level of spending detail available is used to attribute planned Budget spend to the IO model industry categories. Each spending line is attributed to one of 126 industry sectors within the IO model[9] depending on where the money is to be spent. Lastly, these spending lines are summed to the Level 3 groups that are reported on in the Draft Budget as well as to Level 2 and portfolio level.

33. Individual expenditures generate *direct* output changes in the industry that is assumed to receive the money. Within the model, industry can mean anything from private agriculture, manufacturing industries and financial institutions through to public administration.

34. The IO model estimates all the *indirect* output changes; these will be the output changes in industries supplying those industries providing goods and services directly to government.

35. The model also estimates the extra incomes in terms of wages and salaries of households that are generated as a result of the direct and indirect output changes. From these estimates it is possible to calculate further output changes that are required to meet the consumer demand when this household income is spent within the economy. These are the *induced* effects. Annex 4 shows a flow diagram of the method used.

36. The greenhouse gas component of the air accounts in the UK environmental accounts shows emissions by different types of industry and, together with information on the value of industry outputs, it is possible to estimate average emissions for every unit of output. All of the direct, indirect and induced output changes can then be expressed in terms of carbon by applying industry-level greenhouse gas-to-output ratios.

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[9] For the Input-Output tables, including the industrial categories, see:
http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/Input-Output/Downloads

37. As a trading economy Scotland imports a significant proportion of its goods and services (as well as exporting other goods and services to the rest of the world) so it is important that the consequences of these imports are taken into account in the analysis for a consumption-based assessment approach. Therefore, the analysis has been run using two different IO models. A Scottish model, based on the Scottish IO tables, has been used to estimate the domestic emissions. A UK IO model, where imports are not removed from the underlying data tables, has been used as a proxy to derive imported emissions.

38. The estimates therefore assume that the emissions associated with imported goods and services are produced as though they were all produced in the UK economy (using the same processes and carbon intensities). This is appropriate because not only is trade with the rest of the UK significant, but also there is currently no comprehensive individual country IO coverage available within the UK to disaggregate the emission impacts of trade any further.

2.2. Portfolio expenditure and associated emissions

39. Total estimated emissions attributable to the 2010-11 Draft Budget[10] are 11.5 $MtCO_2$-equivalent. The table below shows overall spend and emissions by the individual portfolios and further whether these emissions arise directly, indirectly or are induced. Emissions are almost directly proportional to spend. Health and Wellbeing as well as Local Government as the largest Budget items therefore show the highest emissions.

40. Expenditure is shown net of income, in line with the Draft Budget, and emissions are calculated on the same basis but current systems mean it is not possible to produce an emissions figure based on gross expenditure. See Annex 2 for a fuller discussion of this issue.

Table 2: Portfolio expenditure (excluding non-cash items) and emissions

Portfolio	Spend £m	Total GHG Emissions (thousands of tonnes of CO2-equivalent)				
		Domestic			Imported	Total
		Direct	Indirect	Induced		
Administration	£244	14.4	22.6	20.5	22.4	**79.8**
Crown Office and Procurator Fiscal Service	£114	6.7	10.5	9.5	10.8	**37.4**
Education and Lifelong Learning	£2,778	145.5	238.2	242.4	276.4	**902.5**
Finance and Sustainable Growth	£4,939	388.9	438.2	292.9	627.9	**1,747.9**
Health and Wellbeing	£11,438	350.7	566.9	1,369.5	1,208.6	**3,495.8**
Justice	£1,115	52.4	88.2	93.3	113.3	**347.3**
Local Government	£11,580	1,089.6	985.0	1,257.2	938.6	**4,270.5**
Office of the First Minister	£269	8.5	21.3	21.8	24.0	**75.6**
Rural Affairs and Environment	£587	322.2	113.4	43.8	81.2	**560.5**
Scottish Parliament and Audit Scotland	£87	4.9	7.8	7.4	7.6	**27.6**
Total	**£33,151**	**2,383.8**	**2,492.0**	**3,358.2**	**3,310.9**	**11,544.9**

[10] There is a difference of £2bn between the Draft Budget data and the expenditure that has been used for this carbon assessment. Non-cash items are excluded from the assessment where they do not lead to extra demand for goods and services. For details see Annex 4.

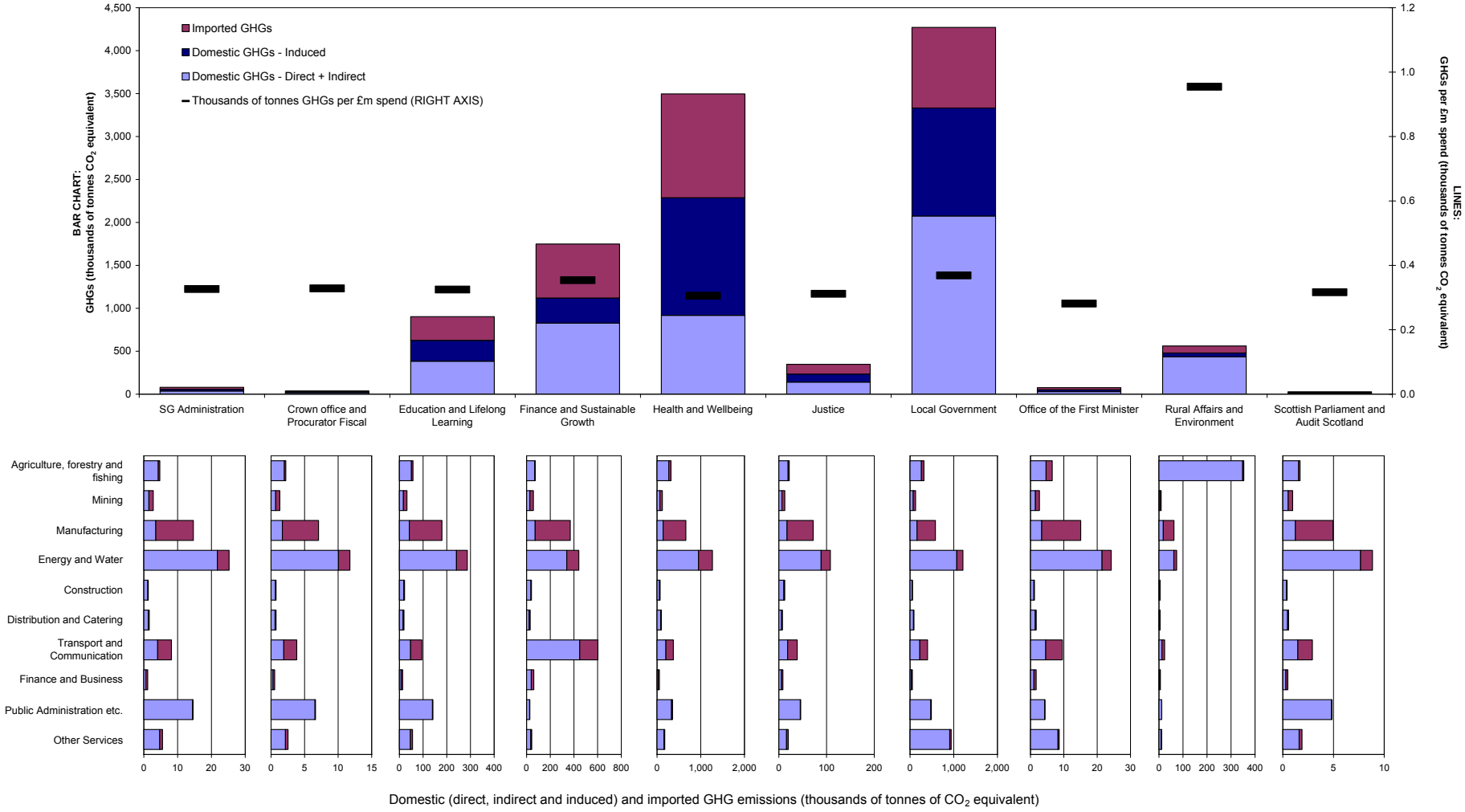
41. Direct emissions account for 21 per cent of the total; indirect emissions (including imported) for a further 51 per cent – a large proportion of which are caused by energy generation. The balance of 28 per cent is the amount of emissions induced by domestic spending arising from the higher incomes generated through Government spending (wages and salaries for Government employees and private sector employees working in industries that supply government).

42. Figure 1 demonstrates graphically the results for individual portfolios and the split by type of emissions (direct/indirect/induced) and also whether the emissions are domestic or imported. As the graph highlights, the emissions intensity of individual portfolios (i.e. carbon emissions per pound spent) is broadly similar. The exception is Rural and Environment Affairs where a large part of expenditure is linked to carbon-intensive production methods (see next section). As the inputs that flow into the portfolio outputs have a great deal in common, re-profiling spending from one portfolio to another is unlikely to result in a great change in overall emissions attributable to the goods and services funded by the Scottish Government.

43. The Budget provides financial detail at three levels of detail: at portfolio level (Level 1) and spending Levels 2 and 3. A one-to-one relationship between spending line and IO industry has been established at the lowest level of detail. All higher-level lines (i.e. Levels 1, 2 and 3) reflect the industrial split of the lower level of detail that they encompass (for the corresponding carbon estimates see Annex 2).

44. The large transfers to Local Authorities (Revenue Support Grant, Non-Domestic Rates) are allocated to different industries using information on final demand by Local Authorities in the IO tables, rather than allocating the lines in their totality to the ‘Public Administration’ IO category.

Figure 1: Estimated domestic and imported GHG emissions (thousands of tonnes of CO_2 equivalent) by portfolio and generating industry. Scottish Government Draft Budget 2010/11



2.3. Emissions by industry source

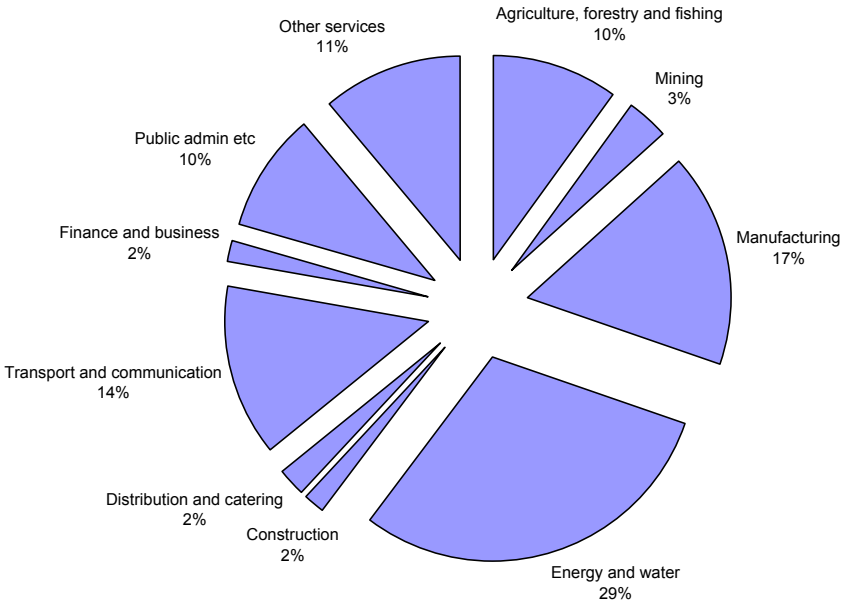
45. The analysis in Figure 1 confirms the overwhelming importance of domestic energy production and emissions in the carbon share of the Scottish Budget. This overall picture applies to individual portfolios with the exception of Rural Affairs and Environment. The Rural Affairs and Environment (RAE) portfolio shows a higher carbon intensity because much of its expenditure supports farming activity, which produces a lot of methane and nitrous oxide per unit of output and these gases have a much greater warming impact than carbon dioxide, the main greenhouse gas generated by the spending of other portfolios. The carbon intensity of agriculture is relatively large compared to most industries (see Annex 4 for a full industry breakdown). Also, agricultural emissions in this portfolio dominate to a greater extent than any other industrial sector in other portfolios.

46. As highlighted above (Section 1.5), the methodology is unable to capture the carbon impact of the outcomes of spend. Carbon sequestration (i.e. the absorption and storage of carbon in, for example, trees and peat) is consequently not included in the estimate of the carbon intensity of the agricultural sector; it is categorised as a consequence of land-use change and cannot currently be linked to the output of the forestry industry, which consists of harvested wood rather than the planting of new forests. The impacts from such activity can, however, be picked up as a part of an assessment process that considers individual policies and programmes.

47. The overall carbon footprint for the RAE portfolio does not include the emissions relating to spending financed by EU funds either. As explained in Section 2.2 this is because the Draft Budget shows net expenditure, i.e. expenditure that is not funded through sources of income like EU funds.

48. Total emissions broken down by industry are shown in Figure 2. Some 29 per cent of the Scottish Government's carbon footprint is caused by the use of energy, followed by manufacturing (17 per cent) and transport (14 per cent).

Figure 2: Overall Government spending - Industry sector share of emissions (domestic direct, indirect and induced, plus imported GHG emissions)



49. Figure 2 demonstrates that to reduce the emissions impact of Government spending, de-carbonisation of the electricity sector is a key measure. As the electricity sector is being decarbonised, the carbon intensity of the sector in the IO tables falls, with a consequential reduction in the carbon emissions recorded in the HLA calculation for the use of electricity.[11]

2.4. Direct, indirect, induced, domestic and imported emissions

50. When calculating the emissions total of Budget and portfolio spending lines, different boundaries may be set. Both direct (for example, emissions occurring as a consequence of the direct combustion of fuels for space heating) and indirect (for example, through the use of electricity, which creates carbon emissions in its generation) effects have been attributed to Budget spending. These emissions would not occur if the funds were not spent.[12]

51. In addition to domestic emissions, the HLA takes into account the emissions generated outside of Scotland in the production of imported goods purchased as a result of Government spending (e.g. fruit imports for induced household spending, or imported computers as indirect effect of Government expenditure).

52. The emissions split between domestic and imported goods shows clear differences (see Figure 3). Imported emissions contain a larger share of

[11] This assessment does not take into account the impact of the EU Emissions Trading Scheme (EU ETS) which, by definition fixes the level of annual emissions. Decarbonising electricity generation will reduce actual emissions in Scotland, but the sale of unused permits will offset this reduction.

[12] It is, of course, possible that lower government spending would be replaced by higher private-sector spending, making little change to overall emissions.

manufacturing and transport reflecting the fact that much of Scotland's demand for manufactured goods is met through imports. Energy accounts for the largest share of domestic emissions because residents' energy demand can only be met locally.

53. The Scottish Budget creates private incomes (both in the public sector and in the private industries whose goods and services are demanded by Government). The Scottish Budget thus induces demand and further economic output, which generates carbon emissions. From a macro-economic perspective it is correct to link induced output and carbon emissions growth to the initial, direct demand impulse caused by Government spending. For this assessment, domestic induced effects have been attributed to the Scottish Budget.

54. Induced effects in other countries, although in principle caused by the same direct demand impulse, are not included in the total. This is in line with the general practice for calculating national carbon footprints, where only direct and indirect effects and no cross-border induced effects are taken into consideration. This approach is intended to generate an estimate that can be compared to the total Scottish carbon footprint.

Figure 3: Domestic and Imported Emissions - All portfolios

Figure 3a: Domestic emissions by industrial sector

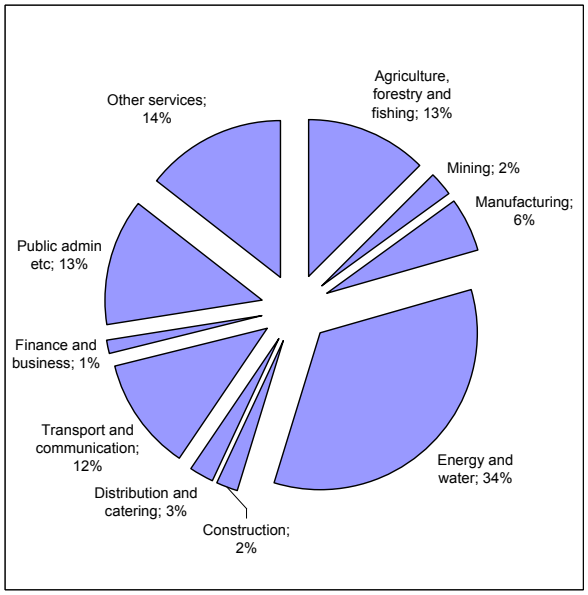


Figure 3b: Imported emissions by industrial sector

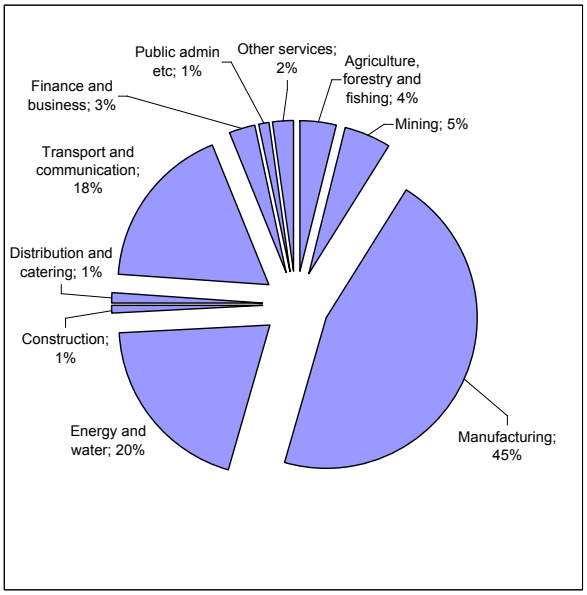


Figure 3c: Domestic and imported emissions, thousands of tonnes of CO_2 equivalent and percent

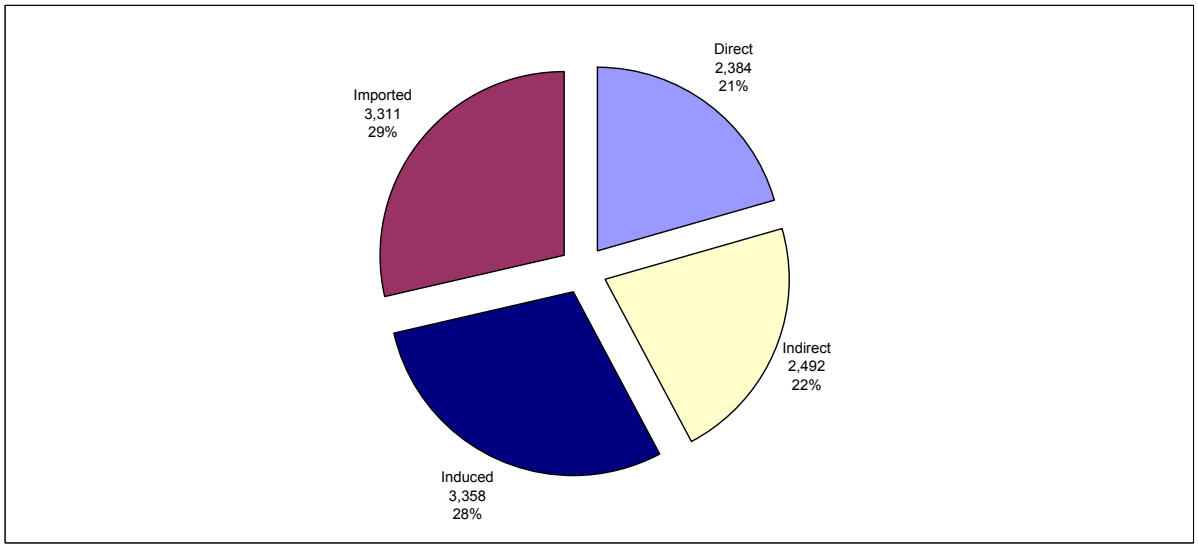
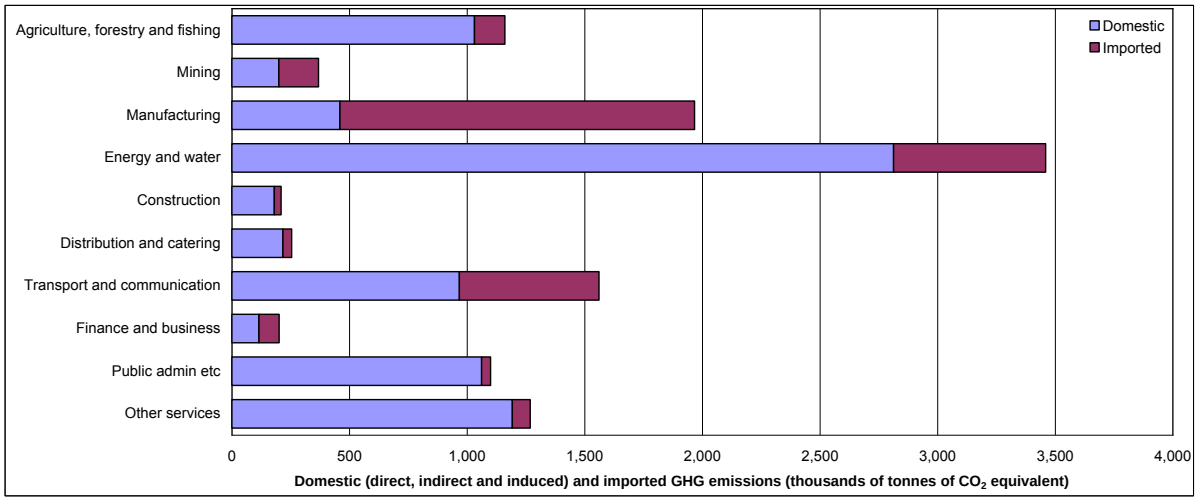


Figure 3d: Domestic and imported emissions by industrial sector



2.5. Individual-level assessments (Carbon appraisals)

55. The carbon assessment presented in the Budget is a summary measure of the carbon impact of Scottish Government spending and can be used to understand the relative impact of total and portfolio spend on Scottish emissions and the key sources of those emissions. To track, evaluate and understand the impact of the Government's carbon reduction actions and policies on Scottish total emissions, including 'use' impacts, other tools are more appropriate.

56. The carbon appraisal of individual policies is an important part of carbon management. Appraisals allow the identification and quantification of the abatement potential of different measures aimed at tackling climate change in an objective, consistent and evidence-based approach, as well as identifying effective and efficient ways of minimising the carbon impact of other policies and interventions.

57. A carbon appraisal looks in detail at the effects of policy measures on carbon emissions, both direct and indirect, in order to capture the consequences of a particular proposal, both positive and negative. Such individual-level assessments of policies are also able to pick up effects (for example, leakage effects of transferring carbon-intensive industries abroad) which are not captured by the HLA.

58. The outputs of an appraisal include the estimated emission reductions/increases of sectors within the EU Emissions Trading Scheme (EU-ETS) and those in non-ETS sectors, changes in the net carbon account, cost-effectiveness of the policy per tonne of CO_2-equivalent, impacts on public finances and security of energy supply, etc. It complements the general cost-benefit analysis described in the Treasury 'Green Book'.[13]

59. The Department for Energy and Climate Change have produced guidance[14] for use in undertaking appraisals. As part of the overall Carbon Assessment Project, this guidance has been assessed for its appropriateness in Scotland, testing its suitability for Scottish Government needs and identifying ways to improve on its accuracy and coverage for use in Scottish appraisals. We are now considering how best to incorporate this into the appraisal process.

60. Individual-level assessments will be able to demonstrate the extent of any emissions savings (or increase in emissions) across the wider Scottish economy and thus inform future annual assessments of performance in relation to the reduction pathway set out in the climate change legislation.

[13] http://www.hm-treasury.gov.uk/data_greenbook_guidance.htm

[14] http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/greengas-policyevaluation.pdf

2.6. Carbon assessments and uses

61. Given the methodology used, the HLA provides, in the first instance, a snapshot of the carbon impact of the Scottish Budget. The table below gives an overview of the suitability of the HLA and the more detailed, individual-level assessments of the Budget for different purposes, from more static, reporting functions to policy evaluation and assessment.

Table 3: Suitability of the two assessment types for different uses

Use	High-level assessment	Individual-level assessment
Carbon Accounting	Consumption-based account per portfolio; provides a comprehensive picture of the carbon impact of spending (based on industry averages).	Aims to provide estimates of emission reductions within the EU-ETS and non-ETS sectors and impact on net emissions account.
Monitoring & Reporting	Indicates long-term trends at a high level of aggregation e.g. public sector or portfolio level. Not suitable for detailed year-on-year monitoring of emissions outcomes within detailed spend areas.	Not a monitoring tool as such but essential for reporting on expected policy impacts. Can also provide a baseline for policy evaluation.
Target Setting	Setting a long-term target at a high level of aggregation e.g. entire public sector. Not suitable for year-on-year target setting for portfolios or individual organisations.	Can be used for assessing achievability of targets and associated costs.
Benchmarking	Can rank portfolios by absolute and relative carbon emissions but requires careful interpretation.	Can benchmark different policy options.

Table 3 (cont.)

Use	High-level assessment	Individual-level assessment
Carbon Hotspots	Can identify hot-spots between and within portfolios – although resolution (Level 3 spending line) varies considerably.	Not designed to identify hotspots.
Emission Reduction Opportunities	Will not identify specific reduction opportunities/ technologies or policies.	Central to appraising the effectiveness of different opportunities.
Policy Assessment	Not suitable for assessment of policy impacts or effectiveness.	Key tool for policy assessment.

62. It is apparent that the strength of the HLA tool lies in giving an overview of the carbon consequences of the output changes that are caused by Government spending and putting expenditure-related emissions into a larger context. It also provides a tool for creating greater awareness within and outside the public sector of the carbon consequences or 'costs' of our actions in order to motivate less carbon-intensive cultures and behaviours and help embed a consideration of carbon within decision-making processes. For detailed assessments of the carbon impact of specific policies, carbon appraisals are more appropriate.

3. Next Steps

63. Potentially, the HLA can be refined in a number of ways. Using detailed information on spending, the IO tables themselves can be disaggregated further to introduce portfolios, e.g. Health and Wellbeing, as separate 'industrial' categories and capture their spending patterns directly in the IO system. Both energy and transport industry data could be further split to account for differences in electricity generation/mode of transport to better reflect changes in use and the associated carbon over time. Such changes to the IO system rely on more detailed information on the sectors and their links into the wider economy becoming available.

64. Another possible enhancement over time would be linking the IO tables to further social and environmental data, apart from the GHG intensities. This would extend the scope of analysis and allow for a fuller appreciation of the trade-offs society faces when allocating public money. Finally, a 'hybrid' EIO approach could be adopted that would, instead of relying on industry averages to estimate direct emissions, use bottom-up data on fuel consumption by Government to provide a more precise estimate.

65. Guidance for undertaking individual-level assessments (carbon appraisals) is being rolled out across the Scottish Government to support policy-making in achieving the carbon-reduction targets. It is a new type of appraisal for Government that will have to be adjusted as understanding of the issues grows.

66. New governance arrangements have been adopted in the Scottish Government to support the development work over the coming year and ensure delivery across the substantial climate change agenda. The Climate Change Delivery Board oversees the work of some 13 workstreams, reflecting the wide-ranging nature of the abatement measures and the range of policy areas involved in tackling climate change. Sector-level workstreams are responsible for building on the Delivery Plan and bringing forward policy detail for inclusion in the statutory Report on Proposals and Policies which is to be published as soon as reasonably practicable after the first batch of annual targets is set (by 1 June 2010).

67. Transformational outcomes around energy, transport and land use must be delivered to put Scotland on the pathway to meeting its 2050 target, while delivering the 10 Energy Pledges will make a vital contribution. Carbon appraisals and more detailed assessments of abatement potential are central to identifying the most effective policy options that will be contained in the Report on Proposals and Policies.

68. Work is underway to develop an effective and workable approach to carbon management within the Scottish Government, drawing on the principles by which finance is managed. Scope for linking to the targets set through the Climate Change (Scotland) Act is being explored. Critical to the success of such an approach will be role of advice and tools to support different parts of Government understand the impact of their business on carbon, and to help them integrate climate change into their decision making. Carbon appraisal of individual policies and programmes will have a central role to play within a carbon management system.

Annex 1 - Glossary

Term	Definition
Carbon/Carbon dioxide equivalent	GHGs vary in their impacts on the atmosphere, and in their potential to contribute to global warming. To simplify comparison of the impact of different GHG emissions, they are normally expressed in terms of the equivalent amount of carbon dioxide they represent.
Carbon appraisal	The carbon appraisal is a policy appraisal process, estimating the emission impact, both in the short and long term, associated with specific policy options. Also referred to in report as Individual-level assessment.
Carbon footprint	This describes the emissions generated by the consumption and use of goods and services (i.e. a consumption-based approach) for Scotland as a whole.
Carbon price	The price for the carbon emission permits established by the EU ETS.
Carbon Management System (CMS)	An internal SG system intended to assign, monitor and manage the emissions associated with actions undertaken by Directorates across the range of SG responsibilities.
Consumption-based	An assessment of emissions that are attributed to the goods and services being consumed, including those associated with the production and transport of imports.
Delivery Plan	A description of measures in key sectors of the economy needed to meet medium- and long-term targets of the Climate Change (Scotland) Act. http://www.scotland.gov.uk/Publications/2009/06/18103720/0
Emissions - direct	Individual expenditures generate *direct* output changes in the industry that experiences greater demand. Any emissions within the industry itself (process emissions) that are the result of such an output change are categorised as direct emissions.
Emissions - indirect	The IO model estimates all the *indirect* output changes; these will be the output changes in industries supplying those industries providing goods and services directly to Government. The direct emissions of those 'upstream' industries are counted as indirect emissions.
Emissions - induced	The IO model is also able to estimate the extra income in terms of wages and salaries of households that are generated as a result of the direct and indirect output changes. From these estimates it is possible to calculate

	further output changes that are required to meet the consumer demand when this household income is spent within the economy. These are the *induced* effects that lead to induced emissions.
Environmental Input-Output (E-IO)	The Environmental Input-Output methodology uses economic input-output tables and industry-level environmental data to estimate the environmental impacts per pound (£) sold by an industry.
European Union Emissions Trading Scheme (EU-ETS)	Pan-European trading system of emission permits that includes the power sector and energy-intensive industries.
Greenhouse gas (GHG)	Gases that contribute to global warming. In the case of the Climate Change (Scotland) Act 2009, the following gases and groups of gases are considered to be GHGs: carbon dioxide; methane; nitrous oxide; hydrofluorocarbons; perfluorocarbons; sulphur hexafluoride.
High-level assessment (HLA)	The HLA describes the emissions attributable to goods and services consumed via SG Budget plans. The emissions estimated by this method are a subset of the Scottish carbon footprint.
Individual-level assessment (ILA)	See Carbon appraisal.
Input-Output	Input-Output is a colloquial term used to refer to a class of statistical tables within the Input-Output framework. These include the Supply and Use tables that are constructed directly from survey and other data sources where the former provides estimates of the output of a large number of differentiated products by each industry and the latter provides estimates of the inputs (of products and services) used by each industry to produce their own output.
Net Scottish Emissions Account (NSEA)	Statutory requirement of Climate Change (Scotland) Act. The NSEA uses production-based estimates of emissions in Scotland, taking into account the effect of emissions trading.
Production-based	An assessment of emissions attributed to activities taking place at a specific location (i.e. emissions occurring within Scotland).
Report on Proposals and Policies (RPP)	Contains detailed information on the plans and policies to be implemented to ensure reduction targets are met. Statutory requirement of Climate Change (Scotland) Act 2009.

Annex 2 - High-level Assessment of 2010-11 Budget – Details

1. The tables below show the detail of the carbon assessment down to Level 3 spending lines, including some income lines (such as EU income). Since the Draft Budget is calculated in terms of net expenditure, the carbon assessment of the Draft Budget has been calculated on the same basis. For some portfolios, the Level 3 spending lines already have income netted out whereas others show gross expenditure. Where figures are not already expressed as net it is necessary to show a negative carbon number against the income lines. At Level 2 and at portfolio level, the income is fully netted off and there are no discrepancies between portfolios, making spending lines directly comparable.
2. In the Draft Budget, some Level 3 lines appear both under the 'Local Government' heading as well as the funding portfolios. For the purposes of the carbon assessment they are allocated to Local Government only. Some non-cash items are not considered for the purposes of this analysis (see Section 7.4). Because these items are excluded, the Budget total shown here is lower than that in the Draft Budget itself.

Note: Spend lines are shown in £m and exclude non-cash items
Emissions are shown in thousands of tonnes of CO_2-equivalent
0.0 denotes less than £0.05m or 0.05 thousand tonnes
Zeros shown as "-"

thousands of tonnes of CO_2 equivalent

Draft Budget - All Portfolios	Spend (£m)	Direct	Domestic Indirect	Induced	Imported	Total GHG
All Portfolios Total	**33,151.4**	**2,383.8**	**2,492.0**	**3,358.2**	**3,310.9**	**11,544.9**

thousands of tonnes of CO_2 equivalent

Administration	Spend (£m)	Direct	Domestic Indirect	Induced	Imported	Total GHG
Administration - Accommodation	19.8	1.2	1.8	1.7	1.7	6.4
Administration - Capital ICT Projects	7.3	0.3	0.5	0.5	1.7	3.0
Administration - Other Capital Expenditure	2.6	0.1	0.2	0.2	0.6	1.1
Administration - Other Office Overheads	41.1	2.5	3.8	3.5	3.5	13.3
Administration - Scottish Government Staff	168.1	10.1	15.7	14.2	14.4	54.3
Administration - Training	5.4	0.3	0.5	0.5	0.5	1.7
Office of the Queen's Printer for Scotland	0.1	0.0	0.0	0.0	0.0	0.0
Portfolio Total	**244.4**	**14.4**	**22.6**	**20.5**	**22.4**	**79.8**

thousands of tonnes of CO_2 equivalent

Crown Office	Spend (£m)	Direct	Domestic Indirect	Induced	Imported	Total GHG
Crown Office	114.0	6.7	10.5	9.5	10.8	37.4
Portfolio Total	**114.0**	**6.7**	**10.5**	**9.5**	**10.8**	**37.4**

thousands of tonnes of CO2 equivalent

Education and Lifelong Learning	Spend (£m)	Domestic			Imported	Total GHG
		Direct	Indirect	Induced		
Care and Justice	9.0	0.3	0.5	1.0	1.3	3.1
Disclosure Scotland	0.9	0.1	0.1	0.1	0.1	0.3
Education Analytical Services	4.2	0.2	0.4	0.4	0.4	1.3
Positive Futures	11.0	0.3	0.6	1.5	1.2	3.6
Safer Children, Stronger Families	13.7	0.4	0.7	1.8	1.5	4.5
Social Work Inspection Agency	4.0	0.2	0.4	0.3	0.3	1.3
Workforce and Capacity	60.3	3.5	5.5	5.0	5.8	19.9
Children, Young People & Social Care Total	**103.1**	**5.1**	**8.2**	**10.1**	**10.7**	**34.0**
Determined to Succeed	2.4	0.1	0.2	0.3	0.1	0.7
Education Maintenance Allowances	31.6	1.9	2.9	2.7	2.7	10.2
English for Speakers of Other Languages	3.0	0.1	0.2	0.4	0.1	0.8
HQ & Training Grants (Adult Learning)	0.7	0.0	0.0	0.1	0.0	0.2
International Lifelong Learning Strategy	2.3	0.1	0.2	0.2	0.2	0.8
Learning Connections	5.8	0.2	0.4	0.8	0.2	1.6
Other Lifelong Learning Miscellaneous	0.7	0.0	0.1	0.1	0.0	0.2
Science-related Programmes delivered by OCSA	7.6	0.5	0.7	0.6	0.6	2.5
Scottish Credit & Qualifications Framework	0.6	0.0	0.1	0.0	0.0	0.2
Skills Development Scotland Ltd	198.0	6.2	12.9	28.2	7.9	55.2
Skills for Business Network	1.0	0.0	0.1	0.1	0.0	0.3
SQA Vocational Qualification & Skills	1.8	0.1	0.2	0.1	0.2	0.6
Union Learning	1.4	0.0	0.1	0.2	0.1	0.4
Workforce Plus - National Development Work	1.7	0.1	0.1	0.2	0.1	0.5
Young People Who Need More Choices and Chances/Activity Agreement & Learning Agreement Pilots - Combined	11.0	0.3	0.7	1.6	0.4	3.1
Other Lifelong Learning Total	**269.5**	**9.7**	**18.8**	**35.8**	**12.8**	**77.1**
Curriculum	24.1	1.4	2.2	2.0	2.1	7.8
HM Inspectorate of Education	15.2	0.9	1.4	1.3	1.3	4.9
Qualifications, Assessment & Skills	32.2	1.8	2.8	3.0	2.6	10.2
Schools	20.1	0.7	1.4	2.0	2.8	6.9
Support for Learning	15.4	0.5	1.0	2.1	0.7	4.3
Teachers	22.1	0.7	1.4	3.2	0.9	6.2
Schools Total	**129.1**	**6.0**	**10.4**	**13.7**	**10.3**	**40.3**
Capital Funding for Further Education Colleges	109.0	4.1	7.9	6.7	25.7	44.4
Capital Funding for Higher Education Institutions	83.2	3.1	6.1	5.1	19.6	33.9
Current Funding for Further Education Colleges	583.7	34.9	54.4	49.4	49.8	188.5
Current Funding for Higher Education Institutions	991.1	59.3	92.3	83.9	84.6	320.1
SFHEFC Administration	9.1	0.5	0.9	0.8	0.8	3.0
Scottish Further & Higher Ed. Funding Council Total	**1,776.2**	**102.0**	**161.5**	**145.9**	**180.5**	**590.0**
Fees, Grants & Bursaries	332.5	19.9	31.0	28.2	28.4	107.4
SAAS Running Costs	6.6	0.4	0.6	0.5	0.6	2.2
Student Loans Company Administration	5.6	0.0	0.3	0.4	0.1	0.8
Student Loans Interest Subsidy to Banks (outside TME)	4.5	0.0	0.2	0.3	0.1	0.6
Student Loans Net New Lending (AME)	135.0	2.5	6.5	6.3	32.7	47.9
Unwinding of Discount on Debt Sale Subsidy Provision	4.0	0.0	0.2	0.3	0.1	0.6
Unwinding of Discount on Write-off Provision	12.0	0.0	0.6	0.8	0.2	1.7
Student Awards Agency for Scotland Total	**500.2**	**22.9**	**39.4**	**36.8**	**62.1**	**161.2**
Portfolio Total	**2,778.1**	**145.5**	**238.2**	**242.4**	**276.4**	**902.5**

thousands of tonnes of CO_2 equivalent

Finance and Sustainable Growth	Spend (£m)	Domestic			Imported	Total GHG
		Direct	Indirect	Induced		
Highlands and Islands Airports Limited	25.1	0.5	2.3	1.8	3.4	8.1
Support for Air Services	10.3	24.3	1.2	0.7	1.7	27.9
Air Services in Scotland Total	**35.4**	**24.8**	**3.6**	**2.5**	**5.1**	**36.1**
Support for Bus Services	61.2	35.6	6.0	5.6	5.7	52.8
Bus Services in Scotland Total	**61.2**	**35.6**	**6.0**	**5.6**	**5.7**	**52.8**
Commissions	0.6	0.0	0.1	0.1	0.1	0.2
Council of Economic Advisers	0.4	0.0	0.0	0.0	0.0	0.1
Public Service Reform & Efficiency	23.9	1.3	2.0	1.8	3.4	8.4
Scottish Futures Trust	5.9	0.4	0.5	0.5	0.5	1.9
Committees, Commissions & Other Expenditure Total	**30.8**	**1.7**	**2.7**	**2.4**	**3.9**	**10.7**
Concessionary Fares	191.9	111.6	18.7	17.6	17.9	165.7
Smartcard Programme	2.1	0.0	0.1	0.1	0.7	0.9
Concessionary Fares Total	**194.0**	**111.6**	**18.8**	**17.7**	**18.5**	**166.6**
Business Competitiveness	50.5	1.5	3.0	2.4	15.8	22.6
Energy Markets	9.4	0.3	1.0	1.1	0.2	2.5
Enterprise Policy & Delivery (including Scottish Enterprise and Highlands & Islands Enterprise)	256.1	15.0	23.5	21.3	24.1	84.0
European Structural Funds Prog. Admin. Consultancies	1.5	0.0	0.2	0.2	0.0	0.4
Innovation and Industries	20.0	0.4	1.2	1.2	3.5	6.3
Renewable Energy	32.0	1.0	3.3	3.5	1.1	8.8
Scottish Development International	0.7	0.0	0.1	0.1	0.0	0.2
Tourism (incl Visit Scotland)	43.9	0.8	4.8	3.7	3.3	12.7
Enterprise, Energy and Tourism Total	**414.0**	**19.0**	**37.0**	**33.4**	**47.9**	**137.4**
European Regional Development Fund - 2007-13 - Central Government - EC Income	(40.0)	(1.2)	(4.0)	(4.2)	(1.8)	(11.3)
European Regional Development Fund - 2007-13 - Central Government spend	40.0	1.2	4.0	4.2	1.8	11.3
European Regional Development Fund - 2007-13 - Grants to Local Authorities - EC Income	(13.3)	(0.4)	(1.3)	(1.4)	(0.6)	(3.8)
European Regional Development Fund - 2007-13 Programmes - Grants to Local Authorities	13.3	0.4	1.3	1.4	0.6	3.8
European Regional Development Fund - 2007-13 Programmes Total	**-**	**-**	**-**	**-**	**-**	**-**
European Social Fund - 2007-13 Programmes Grants to Local Authorities	8.4	0.3	0.9	0.9	0.1	2.2
European Social Fund - 2007-13 Programmes Grants to Local Authorities - EC Income	(8.4)	(0.3)	(0.9)	(0.9)	(0.1)	(2.2)
European Social Fund - 2007-13 ProgrammesCentral Government - EC Income	(25.3)	(0.8)	(2.6)	(2.8)	(0.4)	(6.7)
European Social Fund - 2007-13 Programmes Central Government spend	25.3	0.8	2.6	2.8	0.4	6.7
European Social Fund - 2007-13 Programmes Total	**-**	**-**	**-**	**-**	**-**	**-**
Ferry Services	78.5	70.0	9.3	6.7	15.7	101.7
Road Equivalent Tariff	9.4	0.2	1.0	0.8	0.6	2.7
Vessels & Piers	14.8	0.3	0.7	0.5	4.6	6.2
Ferry Services in Scotland Total	**102.7**	**70.5**	**11.0**	**8.1**	**21.0**	**110.6**
General Register Office for Scotland - Administration Costs	25.3	1.5	2.4	2.1	2.2	8.2
General Register Office for Scotland - Capital	0.8	0.0	0.1	0.0	0.2	0.3
General Register Office for Scotland - Income	(5.1)	(0.3)	(0.5)	(0.4)	(0.4)	(1.6)
General Register Office for Scotland Total	**21.0**	**1.2**	**1.9**	**1.8**	**1.9**	**6.8**
Capital Land	2.1	0.0	0.1	0.1	0.9	1.1
Capital Works	173.4	2.7	7.0	4.8	73.5	87.9
DBFO Payments	48.0	2.5	4.6	3.8	9.2	20.1
Forth and Tay Bridge Authorities	10.7	0.5	0.9	0.8	2.2	4.4
Forth Crossing	30.0	1.6	2.9	2.4	5.7	12.6
Network Strengthening & Improvements	41.0	0.6	1.7	1.1	17.4	20.8
Other Current Exenditure incl Surplus Land Valuation Adj.	5.7	0.3	0.5	0.4	1.1	2.4
Roads Improvements	49.7	0.8	2.0	1.4	21.1	25.2
Routine & Winter Maintenance	65.8	3.4	6.4	5.2	12.6	27.5
Structural Repairs	26.4	1.4	2.5	2.1	5.0	11.1
Motorways and Trunk Roads Total	**452.8**	**13.7**	**28.7**	**22.0**	**148.7**	**213.1**
Agency Administration Costs	16.0	1.0	1.5	1.4	1.4	5.2
Major Public Transport Projects	175.7	2.7	7.1	4.9	74.4	89.1
Strategic Transport Projects Review	5.3	0.1	0.6	0.5	0.4	1.5
Transport Information	2.9	0.1	0.3	0.3	0.2	0.8
Other Transport Agency Programmes Total	**199.9**	**3.8**	**9.5**	**6.9**	**76.4**	**96.6**
British Waterways Scotland	11.5	0.2	1.1	0.9	1.4	3.6
Road Safety	2.8	0.1	0.3	0.2	0.2	0.8
Support for Sustainable and Active Travel	11.2	0.2	0.9	0.7	2.3	4.0
Support for the Freight Industry	10.3	1.0	0.7	0.5	2.7	5.0
Transport Strategy and Innovation	6.6	0.1	0.7	0.6	0.5	1.9
Other Transport Directorate Programmes Total	**42.4**	**1.7**	**3.8**	**2.8**	**7.0**	**15.3**
Architecture and Place	1.7	0.1	0.1	0.2	0.1	0.4
Building Standards	0.3	0.0	0.0	0.0	0.0	0.1
Planning	2.3	0.1	0.2	0.2	0.1	0.7
Planning and Environmental Appeals	0.7	0.0	0.1	0.1	0.1	0.2
Planning Total	**5.0**	**0.2**	**0.5**	**0.5**	**0.3**	**1.4**
Rail Development	0.9	0.0	0.1	0.1	0.1	0.3
Rail Franchise in Scotland	315.2	78.5	59.0	22.2	25.3	185.0
Rail Infrastructure in Scotland	331.0	7.0	23.9	18.5	73.0	122.4
Rail Small Programmes	20.0	0.4	1.0	0.7	6.3	8.4
Rail Services in Scotland Total	**667.1**	**85.9**	**83.9**	**41.5**	**104.6**	**316.0**
NHS in Scotland Pension Scheme	1,330.2	8.0	117.2	73.6	66.4	265.3
Scottish Public Pensions Agency Administration	9.3	0.5	0.8	0.8	1.0	3.1
Scottish Teachers Pension Scheme	1,186.1	7.2	104.5	65.7	59.2	236.5
Scottish Public Pensions Agency Total	**2,525.6**	**15.7**	**222.5**	**140.1**	**126.6**	**504.9**
Scottish Investment Fund	14.8	0.1	0.7	1.0	0.2	2.1
Third Sector Development	20.8	0.6	2.2	2.3	0.3	5.5
Third Sector Total	**35.6**	**0.7**	**2.9**	**3.4**	**0.6**	**7.5**
Climate Change	1.2	0.0	0.1	0.1	0.0	0.3
Support for Scottish Water Borrowing	150.0	2.7	5.3	4.0	59.7	71.7
Water & Climate Change Total	**151.2**	**2.8**	**5.4**	**4.2**	**59.7**	**72.0**
Portfolio Total	**4,938.7**	**388.9**	**438.2**	**292.9**	**627.9**	**1,747.9**

thousands of tonnes of CO_2 equivalent

Health and Wellbeing	Spend (£m)	Domestic			Imported	Total GHG
		Direct	Indirect	Induced		
Promoting Equality	20.4	0.7	0.7	2.3	0.9	4.6
Promoting Social Inclusion	7.2	0.3	0.2	0.8	0.3	1.6
Equalities & Social Inclusion Total	**27.6**	**1.0**	**0.9**	**3.1**	**1.2**	**6.2**
Food Standards Agency	11.0	0.7	1.0	0.9	1.0	3.6
Food Standards Agency Total	**11.0**	**0.7**	**1.0**	**0.9**	**1.0**	**3.6**
Access Support for the NHS	131.3	3.9	6.1	16.5	12.4	38.9
Alcohol Misuse	44.4	1.3	2.1	5.6	4.2	13.1
Clean Hospital/MRSA Screening Programme	18.3	0.5	0.8	2.3	1.7	5.4
Distinction Awards	30.0	0.9	1.4	3.8	2.8	8.9
eHealth	134.7	4.0	6.2	16.9	12.7	39.9
General Dental Services	343.2	10.3	15.9	43.1	32.5	101.7
General Medical Services	700.1	20.9	32.5	87.9	66.2	207.5
General Opthalmic Services	91.0	2.7	4.2	11.4	8.6	27.0
Health Capital (Income)	(16.7)	(0.6)	(1.2)	(1.0)	(4.0)	(6.8)
Health Capital Investment	594.4	21.5	41.4	34.1	143.9	241.0
Health Improv. & Health Inequalities	44.9	1.3	2.1	5.6	4.2	13.3
Health Miscellaneous Other Services	175.9	5.3	8.2	22.1	16.6	52.1
Health Protection	28.1	0.8	1.3	3.5	2.7	8.3
Health Revenue (Income)	(119.5)	(3.6)	(5.5)	(15.0)	(11.3)	(35.4)
Health Screening	8.5	0.3	0.4	1.1	0.8	2.5
Healthy Start	9.0	0.3	0.4	1.1	0.9	2.7
Hepatitis C Action Plan Implementation	18.9	0.6	0.9	2.4	1.8	5.6
Improvement & Support of the NHS	19.9	0.6	0.9	2.5	1.9	5.9
Mental Health Legislation & Services	20.8	0.6	1.0	2.6	2.0	6.2
Mental Wellbeing	5.4	0.2	0.2	0.7	0.5	1.6
NHS & Special Health Boards	8,114.8	242.5	376.2	1,018.5	767.4	2,404.6
Nursing	151.8	4.7	9.9	21.6	6.1	42.3
Pandemic Flu Preparedness	16.0	0.5	0.7	2.0	1.5	4.7
Pharmaceutical Srvs Cntrs Remuneration	186.6	5.6	8.6	23.4	17.6	55.3
Research	67.9	2.1	7.1	7.6	1.1	17.9
Scot. Com. For the Reg. of Care	17.4	0.5	0.8	2.2	1.6	5.2
Specialist Children's Services	19.9	0.6	0.9	2.5	1.9	5.9
Tobacco Control	12.3	0.4	0.6	1.5	1.2	3.6
Workforce	28.5	0.9	1.9	4.1	1.1	7.9
Health Total	**10,897.7**	**329.6**	**525.9**	**1,330.6**	**1,100.7**	**3,286.8**
Affordable Housing Investment Programme	341.7	15.1	28.5	23.7	73.6	141.0
Communities Analytical Services	4.9	0.1	0.5	0.5	0.1	1.3
Community Engagement	3.4	0.1	0.1	0.4	0.1	0.8
Energy Assistance Package	45.9	1.7	3.4	2.8	10.7	18.7
Home Insulation Scheme	15.0	0.8	1.4	1.2	2.9	6.3
Housing & Regeneration Income	(30.0)	(1.6)	(2.9)	(2.4)	(5.7)	(12.6)
Housing Voluntary Sector Grant Scheme	2.4	0.1	0.1	0.3	0.3	0.8
Private Housing	25.2	0.9	1.8	1.6	5.9	10.3
Regeneration Programmes	21.7	0.3	0.9	0.6	9.2	11.0
Scottish Housing Regulator Running Costs	4.7	0.3	0.4	0.4	0.4	1.5
Social Housing	0.5	0.0	0.1	0.1	0.0	0.1
Tackling & Preventing Homelessness	0.6	0.0	0.1	0.1	0.0	0.1
Wider Role	12.0	0.4	0.6	1.6	1.3	3.9
Housing & Regeneration Total	**448.0**	**18.3**	**35.1**	**30.9**	**98.9**	**183.2**
Glasgow 2014: Delivery of Commonwealth Games - Capital	8.0	0.2	0.4	0.3	2.3	3.3
Glasgow 2014: Delivery of Commonwealth Games - Resource	3.6	0.1	0.3	0.3	0.2	0.9
Sport	42.6	0.9	3.2	3.3	4.4	11.8
Sport Total	**54.2**	**1.2**	**3.9**	**3.9**	**6.9**	**16.0**
Portfolio Total	**11,438.5**	**350.7**	**566.9**	**1,369.5**	**1,208.6**	**3,495.8**

thousands of tonnes of CO_2 equivalent

Justice	Spend (£m)	Domestic			Imported	Total GHG
		Direct	Indirect	Induced		
Accountant in Bankruptcy	6.6	0.4	0.6	0.6	0.6	2.1
Accountant in Bankruptcy Total	**6.6**	**0.4**	**0.6**	**0.6**	**0.6**	**2.1**
Community Justice Service Miscellaneous	0.8	0.0	0.1	0.1	0.1	0.2
Offender Services	16.4	1.0	1.5	1.4	1.4	5.3
Victim / Witness Support	5.7	0.3	0.5	0.5	0.5	1.8
Community Justice Services Total	**22.8**	**1.4**	**2.1**	**1.9**	**1.9**	**7.4**
Courts Group	17.1	1.0	1.6	1.5	1.5	5.5
Judicial Salaries	30.0	0.4	1.2	2.7	1.1	5.4
Courts Group Total	**47.1**	**1.4**	**2.8**	**4.2**	**2.5**	**10.9**
CIC Scheme	25.1	1.5	2.3	2.1	2.1	8.1
Criminal Injuries Compensation Administration Costs	3.0	0.2	0.3	0.3	0.3	1.0
Criminal Injuries Compensation Total	**28.1**	**1.7**	**2.6**	**2.4**	**2.4**	**9.1**
Community Safety / Drug Misuse	36.5	1.1	1.9	4.9	4.0	11.9
Drugs & Community Safety Total	**36.5**	**1.1**	**1.9**	**4.9**	**4.0**	**11.9**
Justice Other Miscellaneous	25.6	1.5	2.4	2.2	2.2	8.3
Residential Accommodation for Children	3.5	0.1	0.2	0.5	0.4	1.1
Justice Miscellaneous Total	**29.1**	**1.6**	**2.6**	**2.6**	**2.6**	**9.4**
Legal Aid Administration	12.7	0.2	0.5	1.1	0.7	2.5
Legal Aid Fund	154.5	2.1	6.3	14.0	5.5	27.8
Legal Aid Total	**167.1**	**2.3**	**6.8**	**15.1**	**6.2**	**30.4**
Office of the Scottish Charity Regulator	3.6	0.2	0.3	0.3	0.3	1.2
Office of the Scottish Charity Regulator Total	**3.6**	**0.2**	**0.3**	**0.3**	**0.3**	**1.2**
Police Support Services / Police Information & Communications Technology / Police Other / Special Grants	261.1	15.2	23.9	21.6	25.4	86.1
Police Central Government Total	**261.1**	**15.2**	**23.9**	**21.6**	**25.4**	**86.1**
Scottish Court Service Capital	20.3	0.8	1.5	1.3	4.8	8.3
Scottish Court Service Operating Expenditure	53.3	3.2	5.0	4.5	4.6	17.2
Scottish Court Service Total	**73.6**	**4.0**	**6.4**	**5.8**	**9.3**	**25.5**
Scottish Prison Service Capital Spending	136.8	5.1	10.0	8.4	32.2	55.8
Scottish Prison Service Direct Running Costs	272.9	16.3	25.4	23.1	23.3	88.1
Scottish Prison Service Other Current Spending	9.2	0.5	0.9	0.8	0.8	3.0
Scottish Prison Service Total	**418.9**	**22.0**	**36.2**	**32.3**	**56.3**	**146.9**
Scottish Fire Services College/Other Functions/Firelink	20.0	1.2	1.9	1.7	1.7	6.5
Scottish Resilience Total	**20.0**	**1.2**	**1.9**	**1.7**	**1.7**	**6.5**
Portfolio Total	**1,114.6**	**52.4**	**88.2**	**93.3**	**113.3**	**347.3**

thousands of tonnes of CO_2 equivalent

Local Government	Spend (£m)	Domestic			Imported	Total GHG
		Direct	Indirect	Induced		
General Capital Grant	360.0	13.5	26.2	22.2	84.8	146.7
General Revenue Grant	8,242.0	822.4	704.9	926.1	594.1	3,047.6
Non-Domestic Rates (NDR)	2,068.2	206.4	176.9	232.4	149.1	764.7
Local Government Total	**10,670.2**	**1,042.4**	**908.0**	**1,180.7**	**828.0**	**3,959.0**
Local Government Determined to Succeed	19.2	1.1	1.8	1.6	1.6	6.2
Local Government (Education) Total	**19.2**	**1.1**	**1.8**	**1.6**	**1.6**	**6.2**
Local Government Cycling, Walking & Safer Routes (Capital)	9.1	0.3	0.7	0.6	2.1	3.7
Local Government Strathclyde Partnership for Transport (Capital)	25.0	0.9	1.8	1.5	5.9	10.2
Local Government (F&SG) Total	**34.1**	**1.3**	**2.5**	**2.1**	**8.0**	**13.9**
Local Government Gaelic	4.4	0.3	0.4	0.4	0.4	1.4
Local Government (First Minister) Total	**4.4**	**0.3**	**0.4**	**0.4**	**0.4**	**1.4**
Assistance to Owners affected by Glasgow Stock Transfer (Capital)	15.0	0.6	1.1	0.9	3.5	6.1
Local Government Housing Support Grant (AME)(Resource)	8.1	0.5	0.8	0.7	0.7	2.6
Local Government Vacant & Derelict Land (Capital)	12.2	0.5	0.9	0.8	2.9	5.0
Transfer of Management of Development Funding (TMDF) (Capital)	119.1	4.5	8.7	7.3	28.1	48.5
Local Government (Health) Total	**154.4**	**6.0**	**11.4**	**9.7**	**35.1**	**62.2**
Local Government Criminal Justice Social Work (Resource)	86.5	2.6	4.5	11.6	9.5	28.2
Local Government Fire Capital Grant (Capital)	24.6	0.9	1.8	1.5	5.8	10.0
Local Government Police (Resource)	586.7	35.1	54.6	49.7	50.1	189.5
Local Government(Justice) Total	**697.8**	**38.6**	**60.9**	**62.8**	**65.4**	**227.7**
Portfolio Total	**11,580.0**	**1,089.6**	**985.0**	**1,257.2**	**938.6**	**4,270.5**

thousands of tonnes of CO_2 equivalent

Office of the First Minister	Spend (£m)	Domestic			Imported	Total GHG
		Direct	Indirect	Induced		
Civic Participation	0.7	0.0	0.1	0.1	0.1	0.2
Crown Office & Proc. Fiscal Inspectorate	0.4	0.0	0.0	0.0	0.0	0.1
Office of Chief Researcher	0.4	0.0	0.0	0.0	0.0	0.1
Office of the Chief Economic Adviser	0.7	0.0	0.1	0.1	0.1	0.2
Office of the Chief Statistician	1.7	0.1	0.2	0.1	0.1	0.5
Public Bodies	0.2	0.0	0.0	0.0	0.0	0.1
Strategic Communications	5.0	0.1	0.3	0.5	0.3	1.1
Strategic Research and Analysis	0.8	0.0	0.1	0.1	0.1	0.3
Corporate and Central Budgets Total	**9.8**	**0.3**	**0.7**	**0.9**	**0.7**	**2.6**
Creative Scotland	57.2	2.9	5.2	4.8	4.5	17.4
Cultural Collections	78.9	1.8	5.8	5.8	9.8	23.1
Gaelic	21.7	0.7	1.6	1.8	1.7	5.8
National Performing Companies	26.0	0.6	2.1	2.2	1.7	6.5
Other Arts	2.8	0.1	0.2	0.2	0.2	0.7
Culture & Gaelic Total	**186.6**	**6.0**	**14.8**	**14.8**	**17.9**	**53.5**
International Relations	15.0	0.9	1.4	1.3	1.3	4.9
Major Events & Themed Years	1.8	0.1	0.2	0.2	0.2	0.6
Royal and Ceremonial	0.3	0.0	0.0	0.0	0.0	0.1
Europe and External Affairs Total	**17.1**	**1.0**	**1.6**	**1.5**	**1.5**	**5.5**
Historic Scotland Capital	1.0	0.0	0.1	0.0	0.3	0.4
Historic Scotland Heritage Capital	6.1	0.1	0.5	0.5	0.4	1.5
Historic Scotland Income	(26.9)	(0.6)	(2.2)	(2.3)	(1.6)	(6.6)
Historic Scotland Other Running Costs	6.5	0.1	0.5	0.5	0.4	1.6
Historic Scotland Programme	31.8	0.7	2.5	2.7	1.8	7.8
Historic Scotland Staff Costs	27.8	0.6	2.2	2.4	1.6	6.8
Historic Scotland Total	**46.2**	**1.0**	**3.7**	**3.9**	**2.9**	**11.5**
National Archives of Scotland Accomodation Costs	1.2	0.0	0.1	0.1	0.0	0.2
National Archives of Scotland Capital Expenditure	2.7	0.1	0.2	0.1	0.8	1.2
National Archives of Scotland Income	(0.5)	(0.0)	(0.0)	(0.1)	(0.0)	(0.1)
National Archives of Scotland Other Running Costs	0.7	0.0	0.0	0.1	0.0	0.1
National Archives of Scotland Staff Costs	5.0	0.1	0.2	0.5	0.2	1.0
National Archives of Scotland Total	**9.1**	**0.2**	**0.4**	**0.8**	**1.1**	**2.5**
Portfolio Total	**268.7**	**8.5**	**21.3**	**21.8**	**24.0**	**75.6**

thousands of tonnes of CO_2 equivalent

Rural Affairs and Environment	Spend (£m)	Domestic			Imported	Total GHG
		Direct	Indirect	Induced		
Flood Prevention & Coast Protection	1.4	1.9	0.4	0.1	0.1	2.5
Noise & Air Quality Action	5.0	0.1	0.3	0.4	0.4	1.2
Scottish Environmental Protection Agency	42.8	2.4	3.9	3.5	4.5	14.3
Sustainable Development and Climate Change	15.3	0.8	1.1	1.4	1.1	4.5
Zero Waste	27.9	4.0	12.0	1.6	3.0	20.7
Env. Prot./Sust. Dev & Climate Change Total	**92.5**	**9.2**	**17.8**	**7.0**	**9.2**	**43.2**
Agri Environmental Measures	59.8	137.7	25.6	2.9	9.1	175.3
Business Development	31.6	13.0	3.5	1.0	21.2	38.7
Energy Crop Payments	0.2	0.4	0.1	0.0	0.0	0.5
EU Supp & Rel Services - EU Income	(525.8)	(1,234.5)	(233.4)	(26.8)	(57.2)	(1,551.9)
Forestry	4.9	0.4	1.1	0.4	0.5	2.5
Leader	6.1	15.0	2.8	0.3	0.7	18.7
Less Favoured Area Support Scheme	65.5	161.2	29.8	3.3	7.1	201.3
Payments & Inspections Admin Costs	33.9	2.0	3.1	2.8	3.3	11.2
Protein Crop Payments	0.3	0.6	0.1	0.0	0.0	0.8
Rural Communities	8.8	21.7	4.0	0.4	1.0	27.0
Rural Enterprise	18.2	44.8	8.3	0.9	2.0	55.9
Scottish Beef Calf Scheme	21.0	51.7	9.5	1.0	2.3	64.5
Single Farm Payment Scheme	433.6	1,067.0	196.9	21.6	47.1	1,332.6
Technical Assistance	0.3	0.8	0.1	0.0	0.1	1.0
EU Support and Related Services Total	**158.3**	**281.5**	**51.6**	**7.9**	**37.1**	**378.1**
Forestry Net Capital Expenditure	1.3	0.5	0.1	0.0	0.9	1.6
Forestry Operating Costs/Capital Charges	23.6	2.0	5.6	1.8	2.6	12.0
Forest Enterprise Scotland Total	**24.9**	**2.6**	**5.7**	**1.8**	**3.5**	**13.6**
Forestry Capital Expenditure	19.4	8.0	2.2	0.6	13.0	23.8
Forestry EU Income	(6.1)	(0.5)	(1.4)	(0.5)	(0.7)	(3.1)
Forestry Policy, Regulation & Administration Programme Costs	29.6	2.5	7.0	2.2	3.3	15.0
Forestry Sale of Land	(15.0)	(6.1)	(1.7)	(0.5)	(10.1)	(18.4)
Woodland Grants	27.1	2.3	6.4	2.0	3.0	13.8
Forestry Commission Scotland Total	**55.0**	**6.1**	**12.4**	**3.9**	**8.6**	**31.1**
EU Fisheries Grants/Fisheries Harbour Grants	11.5	0.2	0.5	0.4	4.2	5.2
Marine & Fisheries - EU Income	(7.7)	(0.4)	(0.3)	(0.3)	(2.9)	(3.9)
Marine Scotland	56.6	3.4	5.2	4.5	8.7	21.8
Marine and Fisheries Total	**60.4**	**3.3**	**5.3**	**4.6**	**10.0**	**23.2**
Agricultural & Horticultural Advice and Support	5.1	0.9	0.4	0.5	0.2	2.0
Animal Health	1.2	0.0	0.1	0.2	0.1	0.4
Crofting Assistance	5.6	3.2	0.9	0.4	1.0	5.5
Food Industry Support	2.0	4.9	0.9	0.1	0.2	6.1
Landscapes & Habitats Programme	0.3	0.0	0.0	0.0	0.0	0.1
National Parks	11.7	0.3	0.9	1.0	0.7	2.9
Rural Cohesion	1.0	2.3	0.4	0.0	0.1	2.9
Scottish Natural Heritage & Deer Commission for Scotland	65.0	3.9	6.0	5.5	5.7	21.0
Veterinary Surveillance	4.8	0.1	0.2	0.6	0.5	1.4
Natural Heritage and Rural Services Total	**96.6**	**15.6**	**9.9**	**8.3**	**8.5**	**42.4**
Contract Research Fund	8.4	0.3	0.9	0.9	0.1	2.2
Economic & Other Surveys	1.6	0.0	0.2	0.2	0.0	0.4
Programmes of Research	74.0	2.2	7.4	7.7	3.7	21.0
Research, Analysis & Other - EU Income	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Royal Botanic Garden - Edinburgh	10.1	0.3	1.0	1.1	0.4	2.8
Research, Analysis & Other Services Total	**94.1**	**2.8**	**9.4**	**9.9**	**4.2**	**26.4**
Drinking Water Quality Regulator	0.4	0.0	0.0	0.0	0.0	0.1
Private Water	5.0	1.0	1.2	0.2	0.0	2.4
Water Quality Total	**5.4**	**1.0**	**1.2**	**0.3**	**0.1**	**2.6**
Portfolio Total	**587.1**	**322.2**	**113.4**	**43.8**	**81.2**	**560.5**

thousands of tonnes of CO_2 equivalent

Audit Scotland and Scottish Parliament	Spend (£m)	Domestic			Imported	Total GHG
		Direct	Indirect	Induced		
Audit Scotland	6.8	0.1	0.3	0.7	0.3	1.4
Audit Scotland Total	**6.8**	**0.1**	**0.3**	**0.7**	**0.3**	**1.4**
Scottish Parliament	80.5	4.8	7.4	6.8	7.3	26.2
Scottish Parliament Total	**80.5**	**4.8**	**7.4**	**6.8**	**7.3**	**26.2**
Portfolio Total	**87.3**	**4.9**	**7.8**	**7.4**	**7.6**	**27.6**

Annex 3 - Carbon assessment project

1. The Carbon assessment project was established to meet Ministerial commitments to assess the carbon impact of Government activity and spend and comprises two main strands of work:

   - the development of a methodology for providing a high-level assessment (HLA) of the carbon impact of total Government spend;
   - the refinement and implementation of methodologies to assess the carbon impact of individual policies and projects (individual-level assessment, or ILA).

2. The outputs from this work help inform the development of mechanisms to drive down emissions associated with Government activity and spend.

High-level assessment

3. Consultants were commissioned in August 2008 to take forward the HLA strand of the carbon assessment Project. They were also tasked with identifying mechanisms for using carbon assessment to drive down emissions.

4. An initial scoping exercise, examining existing approaches to HLA in both the public and private sector (in the UK and internationally), concluded that there was no 'off the shelf' methodology to adopt but identified a number of possible approaches.

5. Recognising the challenging nature of the task an expert workshop was convened at the end of November 2008 to discuss the merits and limitations of different methodologies and identify the most appropriate way forward. The findings provided an overview of possible methodologies along with an evaluation of their fitness for purpose.

6. A number of recommendations were made, including:

   - adopting a staged approach to a) application of the methodology and b) enhancement over time;
   - ensuring effective governance and integration with existing decision-making frameworks to ensure that reduction mechanisms are effective;
   - improving data (most particularly in terms of the GHG inventory for Scotland) to support policy assessment and analytical work.

7. It was also recommended to apply a consumption-based approach (i.e. including indirect as well as direct emissions). This makes the task of carbon assessing the Budget a more complex task but provides a more comprehensive account of the emissions produced by Government spend.

8. A consumption-based approach also avoids the danger of perverse incentives whereby a country can reduce its emissions (in terms of the production-based targets in both the Scottish and UK Acts) by relocating carbon-costly activity overseas.

9. Recommendations for future work on the HLA comprised:

   - an initial ball-park estimate of the carbon impact of the Scottish budget;
   - a more detailed assessment of the carbon impact of total spend in two to three areas of the budget, public sector organisations or major spending programmes using detailed financial accounts and adapted UK or Scotland-specific GHG data (depending on timing and availability);

- development of appropriate mechanisms for using assessment data to support a reduction in emissions and;
- a report including conclusions from the pilot project, recommendations and a road map for further methodological development (subject to an analysis of costs and benefits) and roll out.

Individual-level assessment

10. Work was commissioned to assist in the refinement and implementation of methodologies to assess the carbon impact of individual policies and projects as part of the SG's wider appraisal and evaluation processes.

11. The work comprised three main strands:

- A desk-based review of past efforts to quantify and monetise greenhouse gas impacts of SG policies (ex-ante or ex-post);
- Complete carbon / GHG impact assessments on a small number of policies under development with a view to learning more about the challenges associated with such assessments including any inconsistencies in the application of methods and assumptions;
- A final report identifying the challenges encountered in the quantification and monetisation of GHG emissions and recommendations for ways of addressing these.[15]

[15] This report is available at http://www.scotland.gov.uk/Topics/Research/by-topic/environment/social-research/publications

Annex 4 - Methodology for High-level Carbon Assessment

1. The estimate of the carbon impact of the 2010-11 Budget is based on economic Input-Output tables and industry-level environmental data to estimate the environmental impacts per pound (£) sold by an industry as a result of planned spending by the Scottish Government.

Input-Output model

2. Input-Output (IO) is a generic term used to refer to a class of statistical tables within the IO framework. The tables provide a complete picture of the flows of goods and services in the economy for a given year. They detail the relationship between producers and consumers and the interdependencies of industries.

3. Supply and Use Tables are constructed directly from survey and other data sources. The Supply Table provides estimates of the output of a large number of differentiated products by each industry and the Use Table provides estimates of the inputs (of products and services) used by each industry to produce their own output.

4. Symmetric tables (a.k.a. analytical tables) are derived from the supply and use tables and represent the modelling aspect of the IO framework.

5. In this analysis the symmetric industry-by-industry Leontief inverse tables have been used to estimate total industrial output as a result of changes in final demand.

6. For given changes in final demand (taken as Scottish Government spending here), the Leontief tables are used to show, for each industry, the direct and indirect (type I Leontief) and direct, indirect and induced (type II Leontief) effects upon total output of an additional £ of final demand. The *direct* effect is the increase in the output of a particular industry from an increase in final demand from that industry as producers react to meet the increased demand. The *indirect* effect is the increase in demand for their suppliers and so on down the supply chain as producers increase their output. As a result of the direct and indirect impacts, employment will increase and therefore the level of household income throughout the economy will increase. A proportion of this increased income will be re-spent on final goods and services; this is the *induced* effect.

Environmental Input-Output model

7. The Input-Output methodology estimates the indirect and induced output changes as a result of changes in final demand. Average industry-level environmental data is then used to estimate the environmental impacts per pound (£) sold by an industry. This is the greenhouse gas ratio or the emissions in tonnes of CO_2-equivalent gases for each £1 of output. Since the tables detail inter-industry purchases, it is possible to estimate the overall carbon impact required to meet changes in final consumption by Government. Such extended tables are commonly referred to as Environmental Input-Output models. The application of IO models to assess environmental impacts is well established.

8. The high-level assessment of the Budget uses a Scottish environmental Input-Output model for domestic emissions and a ‘closed economy’ UK model for

emissions associated with imported goods and services[16]. These are based upon Scottish Government Input-Output tables for 2004 (published March 2009) and Office for National Statistics (ONS) Supply and Use tables for 2004 (published for Blue Book 2006). The emissions to output ratios are derived from ONS Environmental Accounts estimates of GHG emissions by industry for 2006 (published June 2009) applied to industrial output figures from ONS Supply and Use tables for 2006 (published for Blue Book 2008).

9. The table below sets out the calculated emissions ratios used in the model. It shows the average emissions resulting from the production of £1 million of UK total output by industry.

2006 GHG emissions ratios

Industry	UK output at basic prices 2006 (£m)	Industry emissions 2006 (thousand tonnes)	2006 Ratio (tonnes of emissions per £1m output)
Agriculture	18,972	50,631	2,669
Forestry	886	82	93
Fishing	1,095	593	542
Mining of coal	847	3,960	4,675
Extraction of petrol and gas	39,972	22,106	553
Mining of metal ores	6,000	1,154	192
Food and beverages	64,594	9,477	147
Tobacco products	1,913	54	28
Textiles	6,168	2,005	325
Clothing manufacture	3,262	266	82
Leather, luggage and footwear	979	88	89
Timber	7,335	1,998	272
Pulp and paper	11,645	4,391	377
Publishing and printing	32,924	1,409	43
Oil Process, Nuclear Fuel	25,472	17,456	685
Industrial gases, dyes, pigments	2,503	1,951	779
Other inorganic chemicals	18,360	5,013	273
Fertilisers, nitrogen compounds	7,174	5,855	816
Paints, varnishes, ink etc	3,444	194	56
Pharmaceuticals	17,154	1,355	79
Soap and detergents	5,629	430	76
Chemical products other	5,521	1,248	226
Rubber products	3,358	859	256
Plastic products	16,736	3,639	217
Glass and glass products	2,922	1,465	501
Ceramic goods	1,429	341	238
Structural clay products	1,920	12,180	6,344
Concrete, stone etc	6,993	1,323	189
Iron and steel	16,863	27,063	1,605
Fabricated metal products	27,385	2,290	84
Machinery and equipment	33,625	1,730	51
Office machinery, computers	8,005	109	14
Electrical machinery and apparatus	13,356	952	71

[16] Ideally, one would use *country-specific* IO tables and emission factors for all imports but such detailed data is not available. The UK IO system is therefore used as a proxy, given that the rest of the UK is Scotland's largest trading partner.

2006 GHG emissions ratios (cont.)

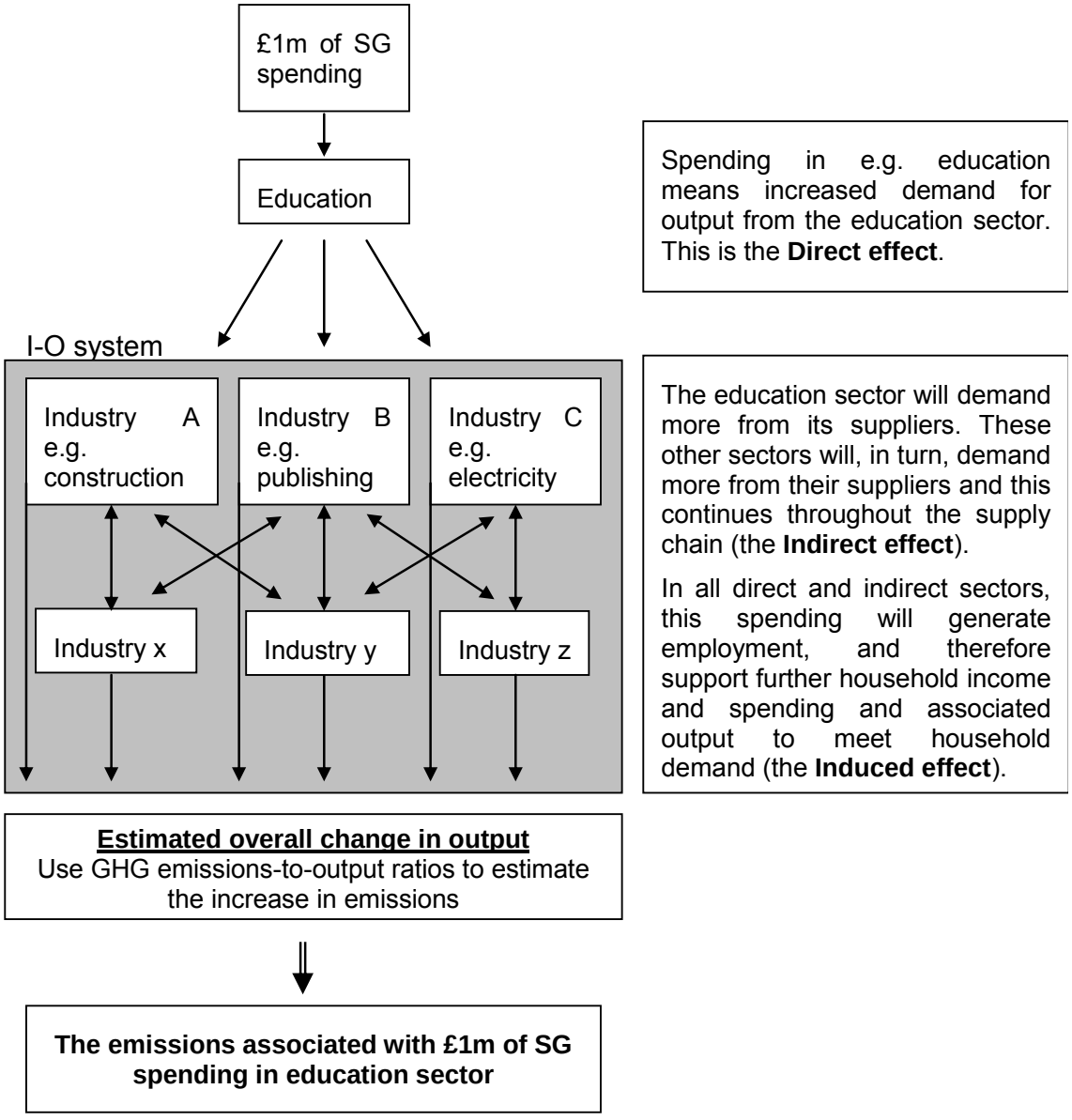
Industry	UK output at basic prices 2006 (£m)	Industry emissions 2006 (thousand tonnes)	2006 Ratio (tonnes of emissions per £1m output)
Radio, television and comms	10,293	404	39
Medical, precision, optical instruments	12,320	567	46
Motor vehicles and trailers	39,498	1,946	49
Other transport equipment	21,451	982	46
Manufacture of other products; recycling	17,916	2,809	157
Electricity production	49,122	191,920	3,907
Gas distribution	18,883	6,660	353
Water supply	5,150	1,095	213
Construction	186,299	10,518	56
Garages, car showrooms	48,164	2,161	45
Wholesale trade except motor vehicles	99,961	5,741	57
Retail & repair trade except motor	106,316	7,991	75
Hotels and restaurants	71,240	2,638	37
Railways	9,240	2,496	270
Other land transport	38,450	24,239	630
Water transport	9,027	19,395	2,149
Air transport	17,006	43,577	2,562
Supporting transport activities	54,608	1,138	21
Post and telecommunications	59,266	1,976	33
Financial intermediation	94,383	405	4
Insurance and pensions	55,541	364	7
Auxiliary finance activities	24,138	370	15
Real estate activities	148,991	986	7
Renting of machinery	19,552	1,335	68
Computer and related activities	55,094	359	7
Research and development	8,701	286	33
Other business activities	189,231	2,776	15
Public administration and defence	129,377	8,392	65
Education	98,799	3,338	34
Health and vet services, social work	160,927	5,215	32
Sanitary Services	17,890	25,132	1,405
Activities of membership organisations	10,243	388	38
Recreation and sporting activities	63,000	1,485	24
Other service activities	15,016	858	57
Private households with employed persons	5,293	217	41
Consumer expenditure - not travel	0	85,826	N/A
Consumer expenditure - travel	0	69,447	N/A
Total	**2,384,827**	**719,099**	**302**

Source: ONS UK Supply and Use Tables 2006 (Blue Book 2008 consistent), ONS UK Environmental Accounts 2009

Emission impact of Government spending

10. The impact of Government spending on GHG emissions can be estimated using environmental input-output model by treating an increase in total Government expenditure as a change in final consumption which will induce higher output from particular industries, which is then multiplied by the relevant emissions-to-output ratios. This can also be done for spending by sub-sector of Government and is illustrated in the flowchart below.

Flowchart: IO analysis of emissions associated with SG spending



Treatment of specific Budget items

11. The lowest level of detail available is used to attribute planned Budget spend to the Input-Output model industry categories. Each spending line is attributed to one of 126 industry sectors within the Input-Output model on a 'who receives the money' basis. These are then summed to the higher-level groups that are reported on in the Draft Budget.

Income

12. The scope of assessment covers spending that is managed by Scottish Government and is included in the Budget but not all spending on behalf of Scotland (e.g. funds managed by UK Departments that reach Scottish recipients). It does not include income from other sources e.g. EU, council tax etc. To be consistent with the approach in the Draft Budget only net expenditure is included in the calculations. That means that income lines, where they are shown in the Budget, have negative carbon scored against them – otherwise the emissions impact of the gross spending line would be counted and not that of net expenditure which is the basis for the Draft Budget.

Non-cash items

13. Non-cash items are accounting constructs (depreciation, cost of capital, impairments) that allow for prudential and economic budgeting. All non-cash items are excluded from the high-level carbon calculations, i.e., they do not carry a carbon consequence, even though they are listed in the Budget.

Depreciation

14. Essentially, depreciation allows the spreading of capital costs over the lifetime of an asset. The carbon emissions could, in principle, be spread in the same manner. However, this means taking into consideration carbon emissions that might have occurred decades ago (in the case of depreciating buildings) and make impossible a comparison of the assessment total with the GHG inventory and other footprinting calculations. Including depreciation would mean that capital spending had to be excluded from the calculations - otherwise the carbon impact would be double-counted (once at the time of expenditure and again later for depreciation).

Cost of capital, Impairments

15. These are accounting constructs to capture opportunity costs and possible actual balance sheet losses, which do not lead to any expenditure with carbon consequences.

Data availability and methodological challenges

16. There are clear limitations with the E-IO approach. The use of industry averages prevents tracking of GHG reductions created by, for example, 'green' procurement. It is a static analysis and cannot model changes in behaviour brought about by policy measures. It assumes a linear relationship between economic activity and GHG emissions but this is not always correct and may lead to over- or under-estimation of emissions, depending on the actual reaction of activity to changes in circumstances. The emissions arising from the *use* of a product or service (such as roads) is beyond the scope of the model.

17. Some Budget lines support multiple purposes of spending (revenue support grant, NHS Board Budgets) without providing detail as to where money is to be spent. In principle, the Budget line could be split up in proportion to historic spending patterns to allow for a more detailed mapping of spending to IO industries. The drawback of this approach is that it imposes a historical view on a forward-looking Budget.

18. The air accounts for the UK are the source for industry emission intensities. The accounts split emissions into 93 industries, the IO tables provide a split into 126 categories. This means that a number of IO industries use identical emission factors because the accounts classification provides less detail and one account category has to be mapped to multiple IO categories.

19. Lags in the production of necessary data mean that the most current Scottish IO tables refer to the year 2004. The estimate uses UK emissions intensities, which are deemed to be the best source currently available.