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# TII Publications

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# Project Appraisal Guidelines Unit 11.0 – Financial Appraisal

**PE-PAG-02044**
December 2023

PE Planning & Evaluation

**Technical**

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**TII Publications**

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# 1. Context

'Financial Appraisal' (FA) is the term used to describe the financial viability of a project. Traditionally FA has been used in the private sector more frequently than the public sector. However, FA has now been identified as an essential component of public investment appraisal. FA should be carried out in advance of an 'Economic Appraisal' (EA) in order to clearly establish the financial cost of a project's options.

FA is an essential tool for policy makers in terms of:

- Evaluating the cash flows that result from implementation
- Understanding the ongoing financial burden of a project over and above the initial capital costs

Financial appraisal is considered mandatory in the preparation of Business Cases for TII projects, regardless of scale and should generally be conducted for all shortlisted options. Generally, shortlisted options at Phase 2 will share similar scopes based on preliminary designs and have only marginal differences in the profile of estimated revenues, capital costs and operational costs over time. In these cases, a financial appraisal can be prepared for the identified preferred option with reference made to the respective costs being representative of the costs for the other shortlisted options. If certain shortlisted options involve a significantly different profile of costs and revenues over time, then a high-level assessment of this is required in the Phase 2 appraisal process.

The scale of FA is proportionate to the scale of the project. Guidance on the scale of the appraisal is provided in this PAG Unit. This PAG Unit has been developed with reference to Module 7 of the Department of Transport (DoT) Transport Appraisal Framework[1] (TAF), which outlines the approach to the preparation of Business Cases for transport projects, and central Government guidance for FA, *Guidelines to Carrying Out Financial Analysis*[2].

[1] Transport Appraisal Framework: Appraisal Guidelines for Capital Investments in Transport - Module 7: Detailed Guidance on Appraisal Techniques (Department of Transport, 2023)
[2] Carrying out a financial analysis (Department of Public Expenditure, NDP Delivery and Reform, 2021)

# 2. Principles of Financial Appraisal

Core to the public sector appraisal process is the concept of 'opportunity cost'; meaning that the demand for public sector intervention exceeds the available resources, and that choices must be made regarding the use of limited public funds. In order to ensure the optimal use of these public funds, the principles of 'effectiveness' and 'efficiency' are enshrined into the public appraisal process by the Department of Public Expenditure, NDP Delivery and Reform (DPENDR).

The question of 'Effectiveness' refers whether a project is the 'right' one from a public perspective in terms of achieving certain economic, social or environmental outcomes, and is primarily addressed by the economic appraisal which examines the wider economic costs and benefits of a project or programme. Financial Appraisal (FA) is mainly concerned with the 'efficiency' of the proposal; ensuring that it is carried out in a way that optimises the use of public funds and resources.

The focus of FA is to evaluate the financial viability of a project from the perspective of the sponsoring agency and the exchequer. While FA is often used in the private sector to assess the commercial viability and performance of an investment, the purpose of public investment is generally not to make a profit, and in practice, many of the outputs of the FA will be negative for public investment projects.

However, a robust FA is necessary to quantify the inflows and outflows associated with a project, to identify the funding that will be required, and ultimately, to ensure that it is affordable for the sponsoring agency and the Government.

According to the TAF, two types of financial appraisal should be conducted for the appraisal of options for publicly funded projects:

- **Discounted Cash Flow (DCF) Analysis** - which quantifies the financial cash inflows and outflows from the perspective of the sponsoring agency. The DCF analysis is required for all projects, regardless of size.
- **Exchequer Cash Flow Analysis** - which quantifies the financial cash flows from the perspective of the exchequer. This takes into account the central funding provided to a project by the exchequer, as well as the indirect inflows and outflows such as taxation and duties. Exchequer Cash Flow Analysis should be conducted when it adds significantly to the project, such as when there are significant income streams/ tax impacts/ multiple sources of funding that are relevant from an Exchequer perspective.
- For TII projects, a third type of finance related analysis is also required:
    - **Affordability Assessment** (also known as an 'Sources of Funding Analysis - which establishes the amount of funding that will be required for a project, as well as the anticipated sources of that funding. This is also required for all projects.

Financial Appraisal is first required at the 'Preliminary Business Case' stage of the appraisal process, which corresponds to Phase 3 (Design & Environmental Evaluation) of the TII Project Management Guidelines (PMG) project phases.

Following the selection of a Preferred Option, the Preliminary Business Case will continue to be revised as the project moves through each subsequent stage of the appraisal process and as more information regarding the project is gained. As this happens, the FA for the Preferred Option should also continue to be updated to incorporate the most up-to-date information, costs, and programme.

# 3. Discounted Cash Flow Analysis

A financial appraisal consisting of a Discounted Cash Flow (DCF) Analysis is mandatory for all business cases. The process of creating a DCF is relatively straight forward, and can be summarised in seven stages:

- **Stage 1:** Identify the project time horizon
- **Stage 2:** Identify cash inflows and outflows
- **Stage 3:** Quantify the cash inflows and outflows
- **Stage 4:** Adjust the pattern of cash flows for the selected time horizon and discount rate
- **Stage 5:** Calculate the key indicators such as the Financial Net Present Value (FNPV) or Internal Rate of Return (IRR)
- **Stage 6:** Sensitivity analysis
- **Stage 7:** Reporting.

An illustrative example of DCF analysis is presented in Table 11.0.3 of this PAG Unit.

**Stage 1:** When carrying out an DCF, it is important to consider the duration of the appraisal period or appraisal time horizon; the period over which costs and benefits will be measured. According to DPENDR, the length of the appraisal period should match the useful economic life of the asset in order to fully take into account its whole-life cost. The appraisal period for the financial appraisal of large road and light rail schemes for example is generally assumed to be 60 years, plus the time it takes to deliver the project[3].

**Stage 2:** Once a time horizon is selected, it is necessary to identify the cash inflows and outflows that arise as a result of the project. In the DCF, inflows and outflows are from the perspective of the sponsoring agency, and examples are shown in Table 11.0.1. The DCF should include both inflation and Value Added Tax (VAT), although it is good practice to show the breakdown of costs between these elements when reporting in the financial appraisal.

The level of detail provided for in DCF should be proportional to the project stage and the scale of spending anticipated. To assist in the preparation of the financial analysis, Table 11.0.1 identifies and describes some of the standard inflows and outflow included in a cash flow analysis.

[3] The time horizon of the FA should be generally consistent with that of the economic appraisal, even if the actual *appraisal period* differs between the two. For example, the economic appraisal might use an appraisal period of 30 years, plus an additional 30 years of residual value to maintain consistency with the 60-year appraisal period of the FA.

**Table 11.0.1 DCF Analysis Example Inflows and Outflows**

| Variable | Description |
|---|---|
| ***Inflows*** | |
| Operating Revenues | Cash flows from the users of the good or service provided by the operation. For a road, this may comprise any tolls (if applicable), or fare revenue for a light rail project. Transfers and subsidies are not included as revenues, nor financial income (e.g., interest rates on deposits). |
| Residual Value/Revenue | If any of the assets in the project are expected to still have a market value or generate revenue after the end of the appraisal period, this should be treated as a cash inflow (e.g., the revenue from the sale of land used for a Motorway Service Area). However, in most cases, if the length of the appraisal period reflects the useful life of the asset, there should be no residual value/revenue.<br>It is also important to note that the concept of residual value in the financial appraisal differs from that in the economic appraisal, as the financial appraisal only considers potential financial/monetary flows that could occur after the appraisal period. |
| ***Outflows*** | |
| Capital Costs | Must include the capital costs of all fixed assets (e.g., land acquisition costs, construction cost of pavement and structures, ITS equipment). In addition to non-fixed assets (e.g., start-up and technical costs such as design, planning, project management, technical assistance, construction supervision, publicity etc.).<br>Investment costs should be split annually over the construction phase in order to account for cash disbursements in line with activity. Environmental mitigation costs identified in a project's Environmental Impact Assessment should also be included. |
| Replacement/Renewal Costs | Include reoccurring costs during the reference period to replace short-life assets and/or equipment (e.g., pavement renewal, engineering plant, IT equipment, office furniture and vehicles). |
| Operating & Maintenance Costs | Costs to operate and maintain the new or upgraded service. Cost forecasts may be based upon historical unit costs where expenditure ensures adequate quality standards. This includes winter operations, routine maintenance, and other recurring costs over the appraisal period. Financing costs should not be included. |
| Revenue Losses | Some projects may result in permanent or temporary losses in revenue for the sponsoring agency, which should also be included as a cost. For example, if construction was expected to close a tolled road for a period of time, the loss of this revenue may be included in the DCF as a cost. |
| Decommissioning Costs | This is the cost of removing an asset from use at the end of its economic life. This often applies to items which are undesirable at the end of their economic life, such as materials for which specialist disposal or recycling is required. |

In addition to the cash inflows and outflows highlighted on the previous page, a number of items explicitly should **not** be included, such as:

- **Depreciation** – Depreciation is primarily an accounting technique used to allocate capital costs and does not represent a physical cash flow for the purposes of the DCF analysis
- **Cash Reserves** - Such as sinking funds

- **Sunk Costs** – Sunk costs refer to costs that have already been incurred at the time of carrying out the appraisal and that cannot be recovered. Unless these are recoverable (e.g., reselling a plot of land that had previously been purchased), these should be excluded from the DCF analysis as they are not affected by any subsequent decision to proceed with the project. However, it is still prudent to note in the FA where costs have been incurred in the past.

**Stage 3**: Once the cash inflows have been identified, it is necessary to quantify the inflows and outflows. This process may require the input of accountants, economists, engineers, quantity surveyors and other specialists, and should be based upon the most accurate available data.

As well as reporting the overall gross value of inflows and outflows, cashflows for each shortlisted option should also be reported 'incrementally', which means that they are based on the difference between the Do-Something and Do-Nothing/Do-Minimum scenarios. For example, if the cost of replacing an asset (Do-Something) was €10 million while the alternative cost of maintaining an existing asset (Do Minimum) was €1 million, then the incremental cost of that option would be €9 million.

As the DCF analysis is carried out from the perspective of the Sponsoring Agency, inflows and outflows should include any VAT paid on costs and provisions for future inflation (detailed below in Stage 4).

**Stage 4**: It is necessary to estimate the flow of funding over the course of a project's useful economic life. As outlined above, cash flows in the DCF analysis should be expressed in nominal terms, meaning that provisions for future inflation should be included. While construction inflation is generally included in capital cost estimates, inflation should also be considered for future O&M costs and for revenue.

After calculating the future value of all inflows and outflows each year, it is then necessary to calculate the 'present value' of these flows by way of discounting. It should be noted that the Financial Discount Rate is different from the Economic Discount Rate used in economic appraisal and is set quarterly by the National Development Finance Agency (NDFA). The applicable discount rate for Financial Appraisal can be found on the DPENDR website[4]. In order to estimate the present value of future cash flows, the relevant discount rate is applied in each year (t) using the following formula:

$$\textbf{Present Value} = \textbf{Sum Total}\left(\frac{\textbf{Future Value}_t}{(\mathbf{1} + \textbf{Discount Rate})^{\mathrm{t}}}\right)$$

**Stage 5**: Three key indicators are used to assess the outcome of cash flow analysis:

- Net Revenues
- Financial Net Present Value
- Financial Benefit - Cost Ratio
- A fourth metric may also be applicable for some schemes:
  - Financial Rate of Return

**Net Revenues** show if the project can sustain itself after initial investment or if supplementary funding is required in order to supplement the projects continuing operation. A note should be made of any periods which incur a loss.

Net Revenues = Operating Revenues – Operating Costs – Replacement Costs

**Financial Net Present Value (FNPV**) is used to estimate the ability of a project to cover operational costs and achieve a return on investment over the project's useful economic life in present values.

[4] Department of Public Expenditure, NDP Delivery and Reform. 'Project Evaluation/Appraisal: Applicable Rates'. Available at: https://www.gov.ie/en/policy-information/1a0dcb-project-discount-inflation-rates/

FNPVs typically produce a negative financial return in public sector appraisal and should not be considered grounds for rejection.

However, identifying additional sources of revenue, or cost/design-based saving measures will improve the possibility of a project being accommodated within the capital budget. FNPV may be calculated by totalling:

FNPV = Discounted Sum Total (Net Revenues – Investment Costs – Decommissioning costs + Residual Value)

As noted above, the overall FNPV of each shortlisted option should be reported, alongside the incremental FNPV of the Do-Something options (i.e. relative to the Do Nothing/Minimum option).

**Financial Benefit – Cost Ratio** is similar to the economic Benefit - Cost Ratio (BCR) except it uses the discounted sum of revenues and discounted sum of financial costs to determine the BCR:

Financial BCR = Discounted Revenues / Discounted Costs

**Financial Rate of Return (FRR)** is the discount rate at which the nominal (non-discounted) value of all financial cash flows would be rendered equal to zero. This is used to estimate the financial attractiveness of a project. This interest rate should be compared to the financial discount rate as set by the NDFA. The FRR can be calculated in excel by applying the IRR formula to the annual nominal value. This is calculated as:

$$0 = \text{Sum Total (nominal value}_{\text{time}}\text{) / (1 + Financial Rate of Return)}^{\text{time}}$$

However, it should be noted that it is not possible to calculate the FRR on all-positive or all-negative cash flows (i.e. if the net cash flows are negative for every year in the appraisal period). This is relatively common in public sector projects, and the FRR may not be applicable to every project.

**Stage 6**: Sensitivity analysis is required with all economic and financial analysis. The purpose of this is to determine variables which give rise to risk. The TAF identifies that sensitivity rates must, at minimum, be applied to transport demand and project costing, including any calculations based upon these assumptions. It is recommended that a sensitivity of 20% and 10% is applied in all cases. A table should be included in the business case outlining the NR, FNPV and FRR for shortlisted options according to the sensitivity. Examples of recommended sensitivity tests are shown in Table 11.0.2.

**Table 11.0.2 Recommended Sensitivity Tests**

| Financial Appraisal Sensitivity Test | |
|---|---|
| **Scenario** | **Test** |
| Costing: for the Target Cost and Total Scheme Budget. | Total Scheme Budgets (TSB) and Target Costs (TC) are produced as part of the EA at Phase 3 and 5. See PAG Unit 6.2 – Preparation of Scheme Costs for further detail. |
| Demand: To account for revenue raising measures such as tolls | Specific County/Metropolitan Area traffic growth sensitivities are provided in PAG Unit 5.3 – Travel Demand Projections. Should be applied to use based calculations e.g., tolling. |

In addition to sensitivity analysis, switching values should be assessed. A switching value is the percentage change required by a variable to render the FNPV to 0. This should be applied to the same set of variables as the sensitivity analysis. The switching value may be obtained using the following formula. If no revenues are observed, a simple statement explaining this will suffice.

Switching Value = (FNPV – Variable)/Variable

**Stage 7**: The results of the DCF analysis should be included in the financial appraisal section of the report. An example of a DCF table is shown in Table 11.0.3.

**Table 11.0.3 Example of DCF Analysis**

| Description/Years (t) | | Total (€ Thousand) | Construction Phase | | Operational Life | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | … | … | 32 |
| a | Tolling Revenue | 60,000 | 0 | 0 | 2,000 | 2,000 | 2,000 | … | … | 2,000 |
| b | Residual (e.g. from the sale of land) | 20,000 | 0 | 0 | 0 | 0 | 0 | … | … | 20,000 |
| c | Total Inflows (a+b) | 80,000 | 0 | 0 | 2,000 | 2,000 | 2,000 | … | … | 22,000 |
| | | | | | | | | | | |
| d | Main Construction Contract | 30,000 | 15,000 | 15,000 | 0 | 0 | 0 | … | … | 0 |
| e | Main Supervision Contract | 6,000 | 3,000 | 3,000 | 0 | 0 | 0 | … | … | 0 |
| f | Archaeology | 100 | 100 | 0 | 0 | 0 | 0 | | | 0 |
| g | Advance Works and Other Contracts | 300 | 300 | 0 | 0 | 0 | 0 | … | … | 0 |
| h | Land and Property | 3,000 | 3,000 | 0 | 0 | 0 | 0 | … | … | 0 |
| i | Planning and Design | 500 | 500 | 0 | 0 | 0 | 0 | … | … | 0 |
| j | Initial Construction Outflows (d:i) | 39,900 | 21,900 | 18,000 | 0 | 0 | 0 | … | … | 0 |
| | | | | | | | | | | |
| k | Ongoing Maintenance Costs | 9,150 | 0 | 150 | 300 | 300 | 300 | … | … | 300 |
| l | Labour Costs | 3,050 | 0 | 50 | 100 | 100 | 100 | … | … | 100 |
| m | Ongoing Operational Outflows (k+l) | 12,200 | 0 | 200 | 400 | 400 | 400 | … | … | 400 |
| n | Total Outflows (j+m) | 52,100 | 21,900 | 18,200 | 400 | 400 | 400 | | | 400 |
| | | | | | | | | | | |
| o | Operational Revenue (c-m) | 67,800 | 0 | -200 | 1,600 | 1,600 | 1,600 | … | … | 21,600 |

| Description/Years (t) | | Total (€ Thousand) | Construction Phase | | Operational Life | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | … | … | 32 |
| p | Nominal Cash Flow (c-n) | 27,900 | -21,900 | -18,200 | 1,600 | 1,600 | 1,600 | … | … | 21,600 |
| q | FNPV (p/s) | 7,947 | -21,517 | -17,659 | 1,518 | 1,419 | 1,465 | … | … | 12,282 |
| r | FRR (IRR(p)) | 1% | | | | | | | | |
| | | | | | | | | | | |
| s | Discount Factor $(1.018)^t$ | N/A | 1.018 | 1.036 | 1.054 | 1.073 | 1.092 | … | … | 1.759 |

# 4. Exchequer Cash Flow Analysis

Exchequer Cash Flow Analysis should be conducted when it adds significantly to the project, such as when there are significant income streams/ tax impacts/ multiple sources of funding that are relevant from an Exchequer perspective.

Exchequer Cash Flow Analysis identifies and quantifies the direct flows which impact upon the exchequer budget (i.e., overall government finances, rather than just those of the Sponsoring Agency).

The process of creating an Exchequer Cash Flow Analysis is similar to the process for carrying out the project cash flow analysis; except in this instance, cash flows are examined from the perspective of the Government. Again, this process may be summarised as a seven-stage process. These stages may be summarised as:

- **Stage 1:** Identify the project time horizon
- **Stage 2:** Identify cash inflows and outflows
- **Stage 3:** Quantify the cash inflows and outflows
- **Stage 4:** Adjust the pattern of cash flows
- **Stage 5:** Calculate the key indicators
- **Stage 6:** Sensitivity analysis
- **Stage 7:** Reporting

For general instruction on how to complete the Exchequer Cash Flow Analysis please see the previous instruction on the project cash flow analysis. The Exchequer Cash Flow Analysis builds on the Financial Net Present Value, with minor adjustments to include additional direct and indirect inflows and outflows associated with the project which solely impact the exchequer. These inflows and outflows are identified in the following paragraphs.

In addition to the outflows and inflows identified in the Project Cash Flow Analysis, dividends and tax impacts may also be included. Dividends are primarily composed of tax impacts but may also include other flows. An adjusted table detailing these inflows and outflows are identified on the following page.

Tax impacts can be subdivided into Indirect Taxes (VRT, Fuel Excise[5], Carbon Charge[6], VAT[7], Customs and Excise) and Direct Taxes (Income and Corporation Tax). In both cases only additional taxes which are directly attributable to the project should be included. Positive tax impacts should be identified as additional inflows. These are illustrated overleaf in Table 11.0.4. This table should be considered supplementary to Table 11.0.1 which details examples of inflows and outflows for DCF analysis

[5] See Appendix A for calculation method.
[6] See Appendix A for calculation method.
[7] See Appendix B for calculation method.

**Table 11.0.4 Examples of Financial Inflows and Outflows for Exchequer Cash Flow Analysis (additional to DCF Inflows and Outflows)**

| Variable | Description |
|---|---|
| **Inflows** | |
| Indirect Dividends | Direct dividends are considered operating revenues e.g. tolling. Indirect dividends also increase as a result of the project going ahead. Examples of indirect dividends include:<br>• VAT[8];<br>• Excise Duty[9];<br>• Carbon Tax[10];<br>• Corporation Tax;<br>• Income Tax;<br>• VRT; and<br>• Avoided Unemployment Costs (social welfare benefit).<br>Inclusions must be net of deadweight and must only include what would not have been received in the absence of the project. |
| **Outflows** | |
| N/A | N/A |

In addition to Tax impacts, other flows should be included. Examples of miscellaneous flows which may impact the exchequer may include Shadow Tolling and PPP Availability Payments, EU finance passing through the exchequer (co-funding) and fines. These may be classified as inflows or outflows accordingly depending on the flow of funds to/from the exchequer.

[8] While VAT paid by the sponsoring agency is included in the DCF analysis, caution should be applied to the treatment of VAT in the Exchequer Cash Flow. While VAT is generally an inflow for the Government, in situations where the government is funding the cost of the project, this can cancel out any VAT paid by the Sponsoring Agency. Take for example a road project that costs €100 million (€15 million of which is VAT): although the gross outflow that the government transfers to the sponsoring agency is €100 million, €15 million of that will return to the government in the form of VAT. This means that the net outflow for the exchequer is only €85 million, and this is what should be entered into the Exchequer Cash Flow Analysis. However, if any of the cost is privately funded, any VAT paid on this portion of the cost should be entered as an inflow.

[9] See Appendix A

[10] See Appendix A

# 5. Affordability Assessment

An affordability assessment confirms the role played by participants in the funding process. In most cases the funding is singularly provided by the sanctioning authority. In this case it is unnecessary to carry out a source of funding analysis. Advice in relation to funding should be sought from the National Development Financing Agency for all PPP projects and projects with costs exceeding €75 million.

However, if funds are sought from more than one source for a project, the analysis should be carried out.

A Source of Funding Analysis is a straight-forward four-stage process. This process can be summarised as:

- **Stage 1:** Identify the project time horizon
- **Stage 2:** Identify providers of funding
- **Stage 3:** Quantify the flows of funding
- **Stage 4:** Confirm funding needs

**Stage 1:** The length of the appraisal period should match the useable economic life of the project. This should match the time horizon adopted for the Cash Flow Analysis.

**Stage 2:** Now that a time horizon is selected, it is necessary to identify the providers of finance. Common providers of finance include EU financing, Exchequer contribution, private capital, EIB funding and other loans.

**Stage 3:** Quantify the flow of funding annually by provider. Tally the total flow of funding. Source of Funding Analysis is also done in 'nominal' terms, meaning that it is necessary to include VAT and inflation in the calculations to ensure that the funding required is not underestimated. Similarly, these flows should not be discounted.

**Stage 4:** Confirm that the flow and timing of funding is sufficient to meet the investment costs. If this is not the case, take corrective action. An example of the affordability assessment is presented in **Table 11.0.5**.

**Table 11.0.5 Affordability Assessment**

| | Year 0 | Year 1 | Year 15 | Year 30 | Ref | Notes |
|---|---|---|---|---|---|---|
| EU finance passing through the Exchequer | 30 | - | - | - | [a] | Scheme Detail |
| Exchequer contribution | 40 | - | - | - | [b] | Scheme Detail |
| EIB financing | 20 | - | - | - | [c] | Scheme Detail |
| Other | 10 | - | - | - | [d] | Scheme Detail |
| Total Funding | 100 | - | - | - | [e] | a + b + c + d |

# 6. Presenting Financial Appraisal Results

The results of all elements of the Financial Appraisal shall be presented in the relevant Section of the Business Case (refer to Business Case template in PAG Unit 8.0 PE-PAG-02033) along with commentary on the results. It additional the financial appraisal section should include references to the derivation/ sources of all costs and revenues used in the analysis.

# Appendix A:

Excise Duty and Carbon Charge

The proposed methodology to calculate Excise Duty is carried out in this Appendix. This is only required for the manual calculation of Excise Duty, which is included in the financial appraisal. Both Excise Duty and the Carbon Charge are calculated automatically in TUBA.

The excise benefit / cost of any road project is measured as the sum of the change in fuel consumption multiplied by the excise duty. This is represented by the equation:

$$EB = (\Delta FC_P * ED_P) + (\Delta FC_D * ED_D)$$

Where:

- EB is the Excise Benefit
- $\Delta$FC is the change in fuel consumption (See Box1)
- ED is the excise duty
- $_P$ denotes petrol
- $_D$ denotes Diesel

The change in fuel consumption calculation is presented on the next page in **Box 1**. Excise duties for petrol and diesel are obtained from the Revenue website under mineral oil taxes. Petrol is classed as ‘light oil’. Diesel is classified as ‘Heavy Oil’. Component A identifies the excise charge. Component B denotes the carbon charge element. While these can be calculated together, it is recommended that these are represented separately in the appraisal.

**Box 1: Change in Fuel Consumption**

To calculate a range of fuel related excises, it is necessary to estimate the change in fuel consumption. Instruction here allows for the manual calculation of the change in fuel consumption (appraisal tool such as TUBA will automatically account for the change in Fuel consumption). Separate calculations are required for diesel and petrol-based consumption as excise differs between these fuel propellants. As fuel consumption also varies by vehicle type it is necessary to also account for this in the following formula:

$$\Delta FC = \Delta FC_{vt1} + \Delta FC_{vt2} + \Delta FC_{vt3} \ldots$$

Where:

- $\Delta FC$ is the change in fuel consumption
- Vt is the vehicle type

Change in fuel consumption is estimated for each vehicle type by the following formula:

$$\Delta FC_{Vt} = n_{vt}(\Delta DT \ * CP_{vt})$$

Where:

- $\Delta FC$ is the change in fuel consumption
- vt is the vehicle type
- n is the number of vehicles
- $\Delta DT$ is the average change in distance travelled
- CP is the fuel consumption parameter

The change in fuel consumption calculation presented above is a distance based calculation, the output of which is presented in litres. The calculation must be made for each vehicle type. The number of vehicles and change in distance travelled can be obtained from the transport model. The consumption parameters are located in PAG Unit 6.11 (Table 6.9 and Table 6.15). This parameter is presented in Litres per 100km. All vehicles are presumed to use diesel propellant aside from petrol car.

# Appendix B:

VAT

The proposed methodology to calculate additional VAT dividend is carried out in this Appendix. This is only required for the calculation of VAT, which is included in the financial appraisal.

The additional VAT benefit / cost of any project is measured as the sum of the change in fuel consumption multiplied by the market price of fuel and diesel. This is represented by the equation:

$$\Delta VATB = \Delta FC_{ft} * MP_{ft} * VATR$$

Where:

$\Delta$VATB is the change in VAT benefit

$\Delta$FC is the change in consumption of the fuel type

MP is the market price of the respective fuel

VATR is the VAT Rate

ft represents the fuel type

$\Delta$FC calculation is demonstrated in Appendix 1. The calculation of Petrol VAT is a straightforward calculation using the above. The VAT rate applied to fuel is the standard rate and is charged on top of all other taxes including excise duty.

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