National Appraisal Parameters Database for the Republic of Zambia

Ministry of Finance and National Planning

USER MANUAL

Table of Contents

[1] The Harmonized Commodity Description and Coding System, generally known as the Harmonized System (HS) is used by the World Customs Organization (WCO) as an internationally standardized system of names and numbers to classify traded products. [2] See the second section of the manual for details

List of Figures

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Introduction

Zambia Commodity-Specific Conversion Factors Database (Zambia CSCF) has been developed by Cambridge Resources International Inc. (CRI) for the National Treasury of the Republic of Zambia. The database contains commodity-specific conversion factors (CSCFs) for estimating the economic values of more than 6,722 tradable commodities and 14 categories of non-tradable services, such as electricity, water, construction, transportation, trade, utilities, financial services, and other services. The database also estimates Economic Opportunity Cost of Labour (EOCL) for seven categories of labour with different range of skills and labour market types applicable to Zambia.

The database is created to search for, present, and update, whenever necessary, the CSCFs for Zambia's Labour and tradable and non-tradable goods and services. It is designed for professionals involved in the economic and social appraisal of investment projects in Zambia.

The program provides multiple ways to search and browse the database with an easy to learn interface. CRI has estimated the CSCFs in this database based on the prevailing distortions (taxes, custom duties, subsidies, etc.) in the Zambian economy.

This user manual provides a helpful guide on how to use the system and all its components. The rest of the manual is organised as follows. The first section describes the user interface of the program. The second section provides a brief discussion of the use of CSCFs and EOCL in project evaluation, their different types and the choice of the relevant ones when carrying out an economic appraisal of an investment project.

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Zambia CSCF Interface

Home Page

Users will be met with a homepage every time they visit the website and from here, they can use the top navigation pane to access all parts of the website.

Figure 1: Landing Page

Search Tradables

The search tradables page is a comprehensive search engine that facilitates the search

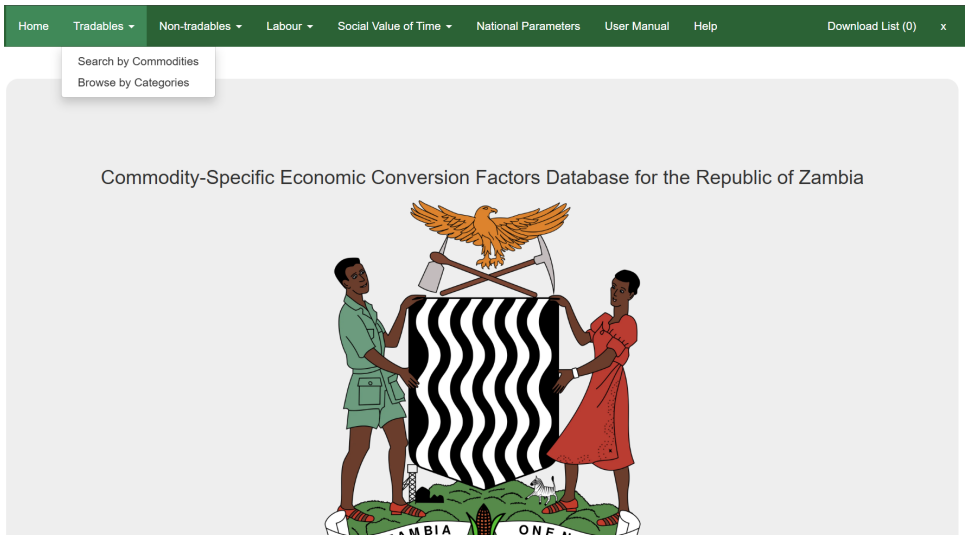

Figure 2: Search Tradables Page

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for more than 6,722 tradable commodities in the database.

In the search bar, a user can search according to **keyword**, **HS Code**[1] or **(Sub)Chapter Number**.

After typing the desired **keyword**, **HS Code** or **(Sub)Chapter Number**, users can press enter or click the search button to reveal the search results. The X symbol can be pressed at any time to reset the search.

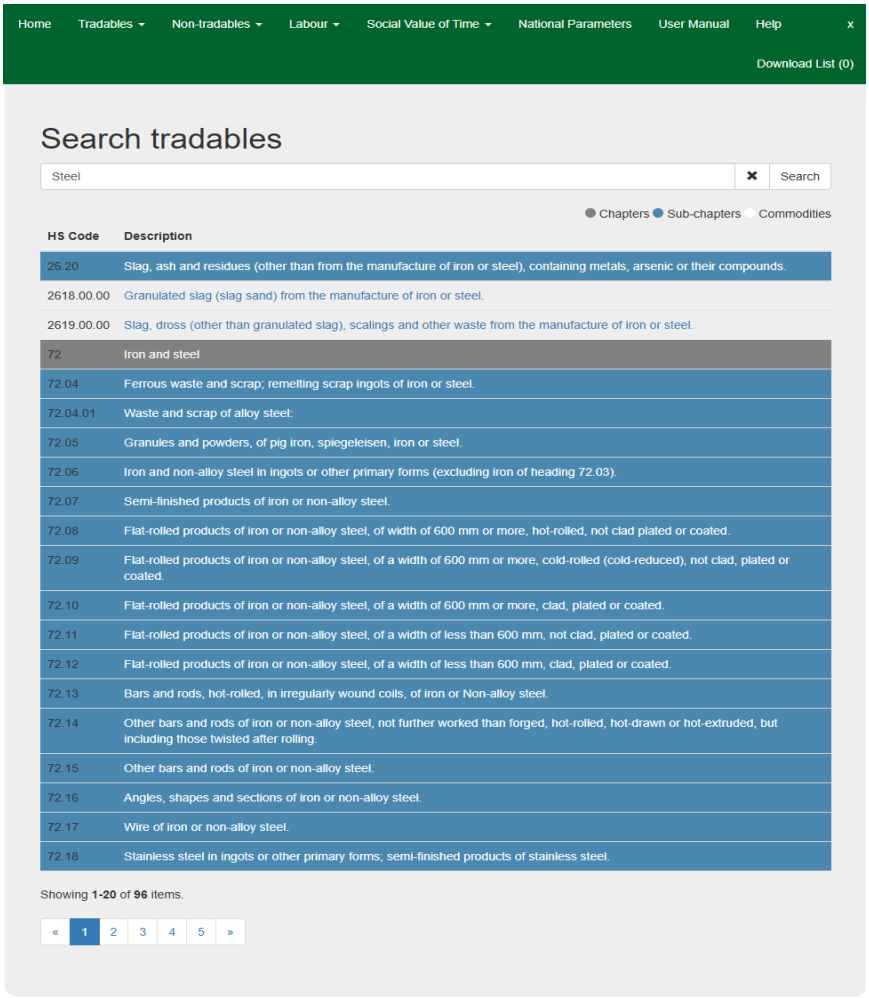

Figure 3: Sample Search Results for "Steel"

Search colour coordinates Chapters (Gray), Sub-chapters (Blue) and Commodities (White). The (sub)chapters and commodities are displayed in the database as they are categorised in the HS code system.

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If a chapter or a sub-chapter is selected, the user is directed to the chapter with all subchapters displayed in the browse tradable page.

If a commodity is selected, the user is directed to the calculation page where they can view or perform simulations on the CSCF of the selected commodity.

Browse Tradables

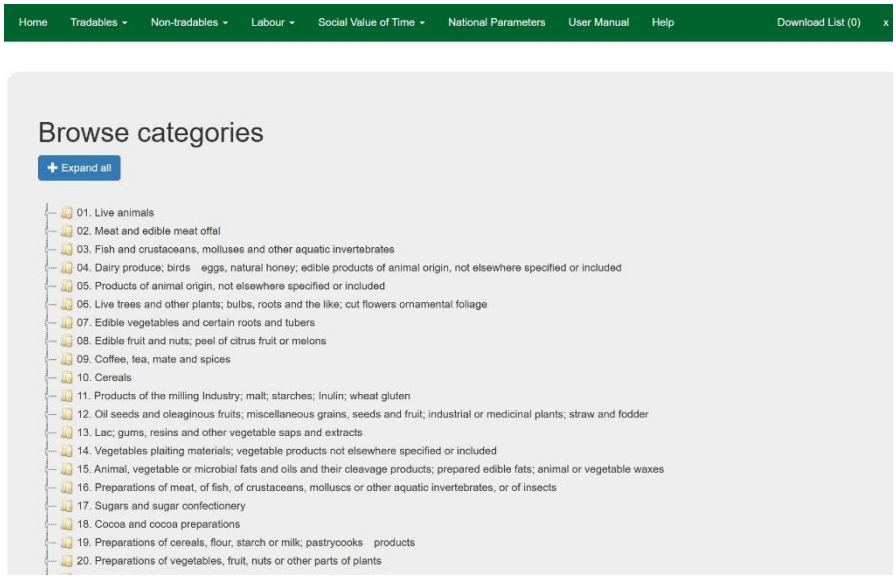

Figure 4: Browse Categories Page

Browse categories page provides an alternative way to search through tradable commodities, categorised into 99 HS chapters. When a user selects a chapter, the chapter will expand and reveal all sub-chapters associated with the chapter. Once the

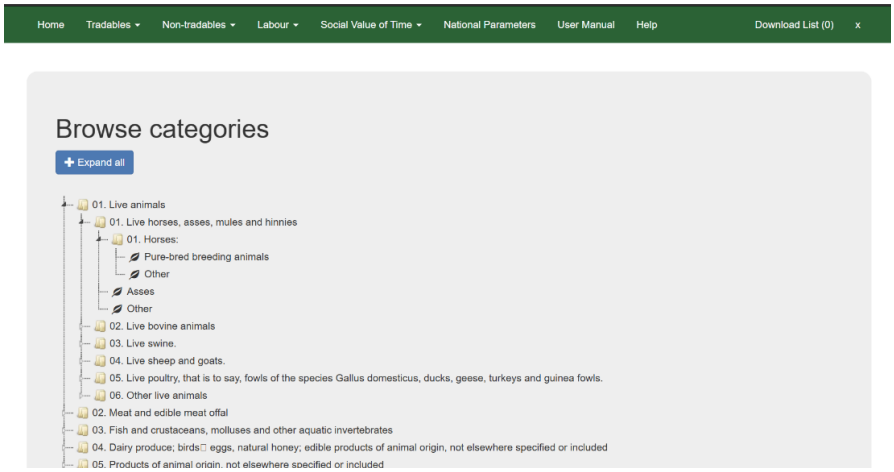

Figure 5: Sample Chapter, Sub-chapter Expansion

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sub-chapter is also selected, it will expand to show all commodities within the sub-chapter.

Once a commodity is selected, the user is directed to the calculation page to view, download and/or perform simulations on the CSCF of the commodity.

Collapse All button will collapse the tree into its original state.

Conversion Factors for Tradables

A user can access this page by either searching for a commodity and clicking it on the search tradable page, or alternatively, browsing by category and selecting a commodity via the browse categories page.

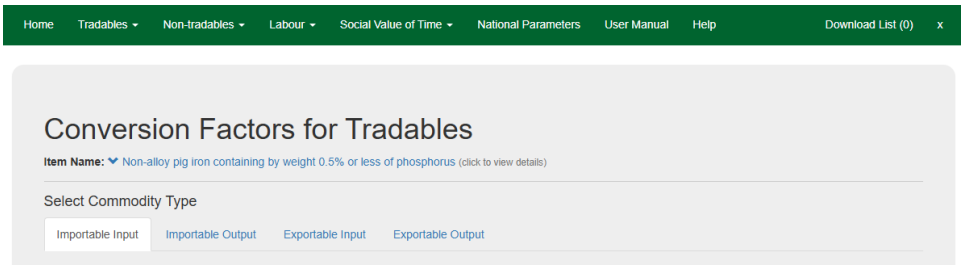

Figure 6: Conversion Factors for Tradables

Item Name refers to the commodity description, in the above example "Non-alloy pig iron containing by weight 0.5% or less of phosphorus" commodity is selected.

Clicking on the item name or "click to view details" will reveal detailed information about the commodity such as its HS Code, Chapter Name as well as its Category, Sub-Chapter Name, Unit of Qty, VAT Category and Remarks.

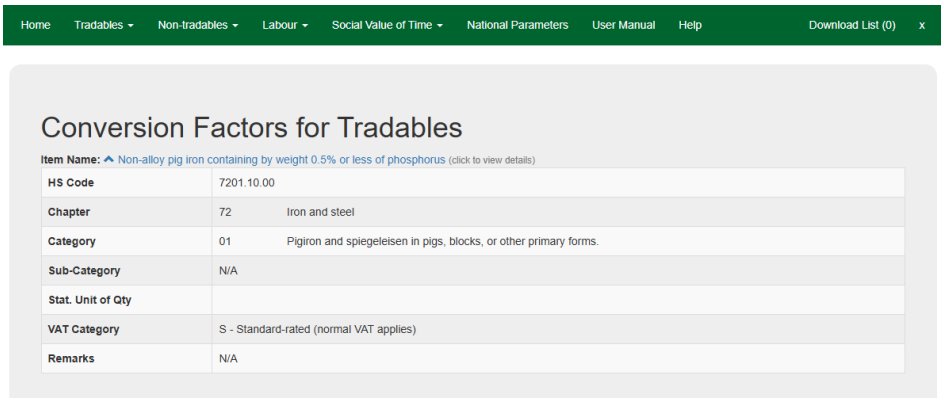

Figure 7: Expanded Item Details

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Four different commodity types can be selected to reveal different estimations, which are "**Importable Input**", "**Importable Output**", "**Exportable Input**" and "**Exportable Output**".[2]

Once a commodity type is selected, a tab will appear and present the user estimation results as well as options for the user to practice estimations by inputting values into the table.

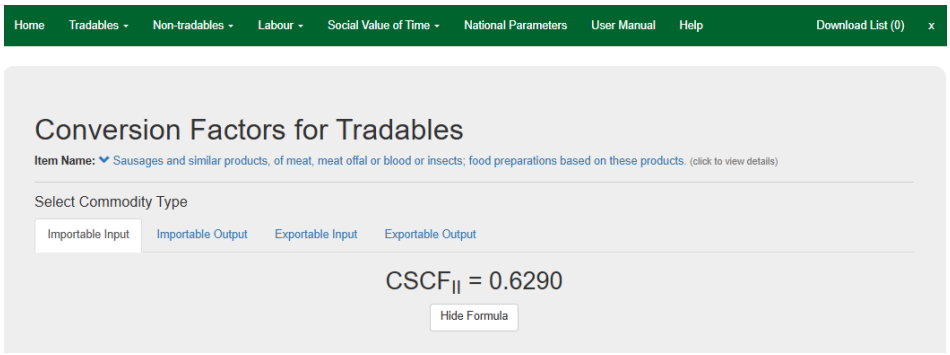

Figure 8: Importable Input Commodity Type Selected

Show Formula will reveal the estimation formula for the commodity type.

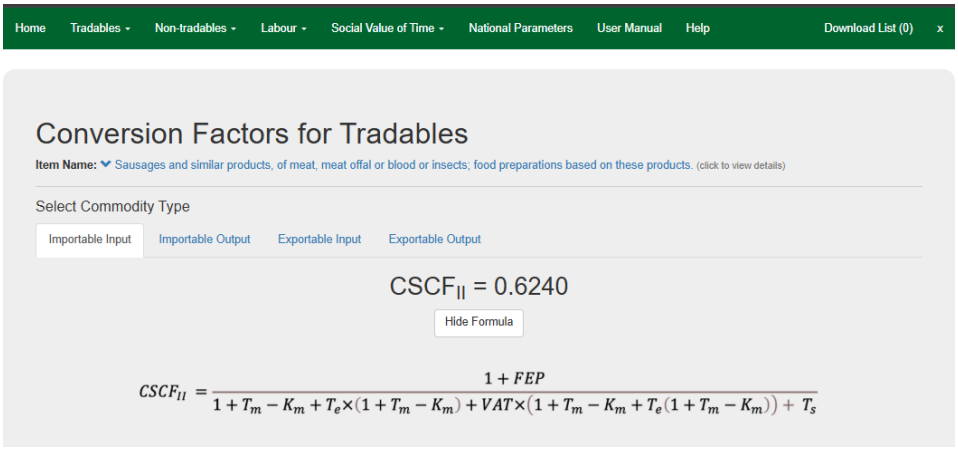

Figure 9 Show Formula Button Expanded (Tradable Section)

Hide Formula hides the currently expanded formula.

The table allows a user to input different values and recalculate to display a new estimation result.

Base Input Values are calculated using the base input values as of the designated year.

Recalculate commits the Updated Input Values to the formulation and displays the

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estimation with the updated values.

Reset allows resetting of the inputted values for the estimation results.

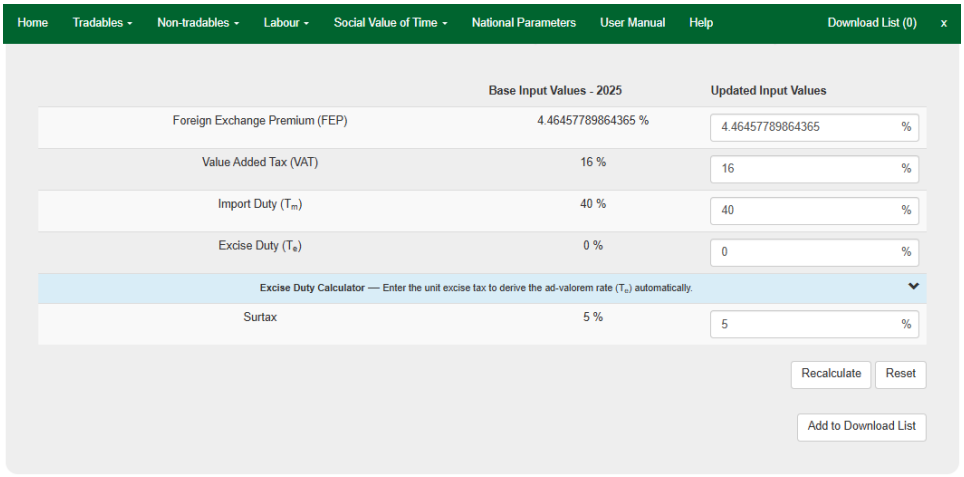

Figure 10: Simulation Table for Updating Input Values

The **Excise Duty Calculator** allows users to enter a specific unit excise tax to derive the equivalent ad-valorem rate (T_e) for a commodity. For items like "Other Fuel oils," which carry a specific excise tax, the calculator will automatically expand when the

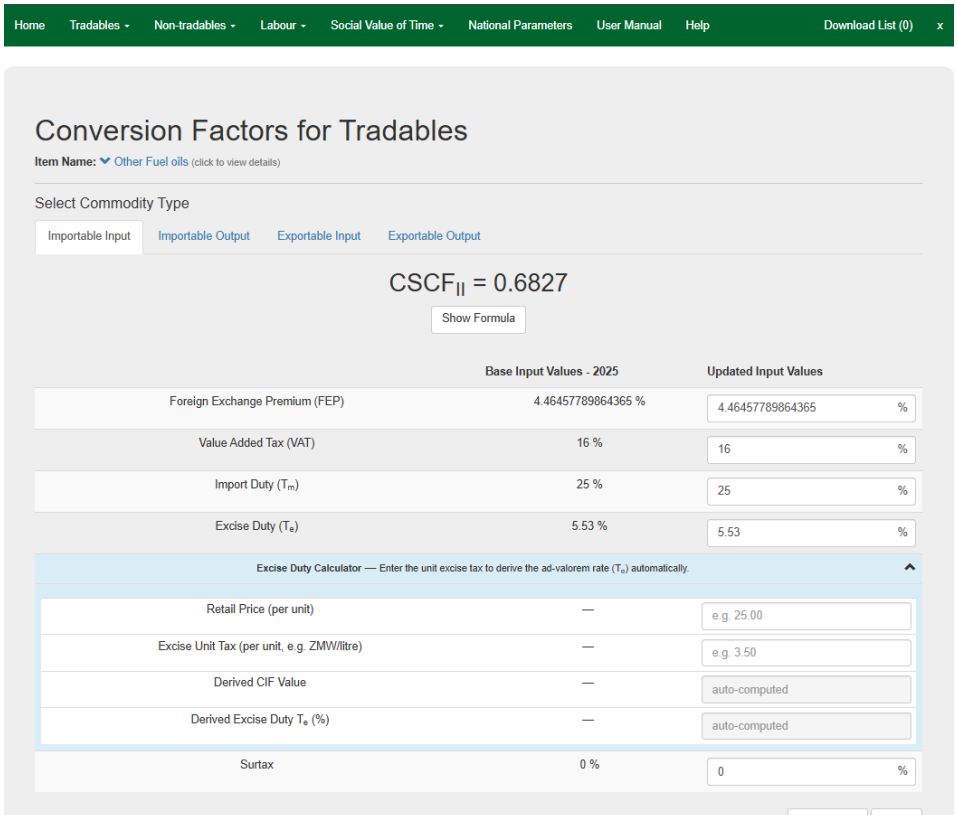

Figure 11: Simulation table for calculating Derived Excise Duty.

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commodity details are viewed. Conversely, for commodities with a 0% excise duty value, the calculator will remain collapsed by default**.**

Add to Download List allows users to save their estimation results to an excel file which can be downloaded by pressing the "Download List" from the top menu.

User can add various commodities (tradable and/or non-tradable) or different types of a particular tradable commodity to the download list by clicking "Add to Download List" each time CSCF is displayed for the commodity. Once the desired numbers of items are added to the list, the list can be downloaded by clicking the "Download List" on the top right of the navigation pane.

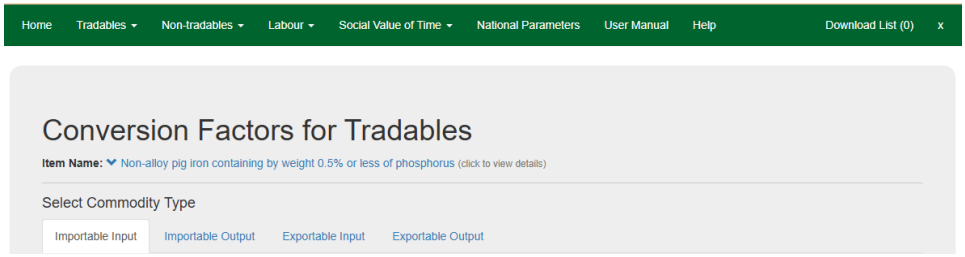

Figure 12: Download List on Top Right

By pressing the X button next to the "Download List", the accumulated list of commodities will be reset back to zero.

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Non-tradables

Fourteen non-tradable items covering several categories and services are calculated in this section.

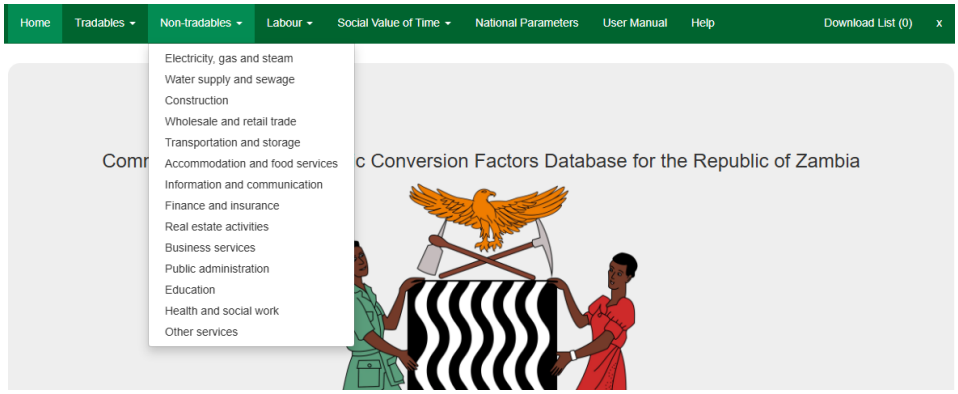

Figure 13: Non-tradables Menu Items

Once a user selects a service, they will be redirected to the conversion factors page where they can see the estimation results as well as options for the user to practice estimations by inputting values into the table.

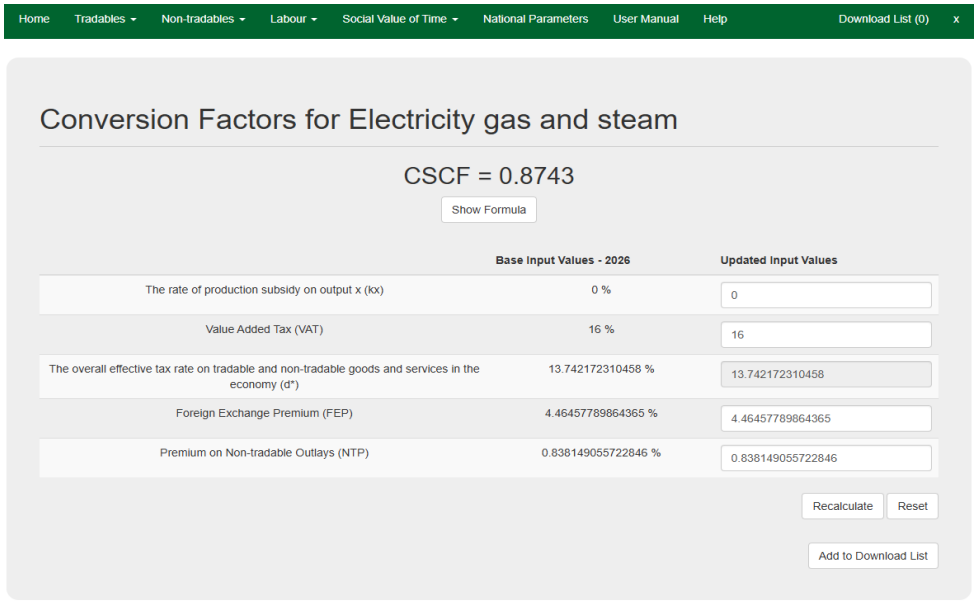

Figure 14: Non-tradables Estimation Page

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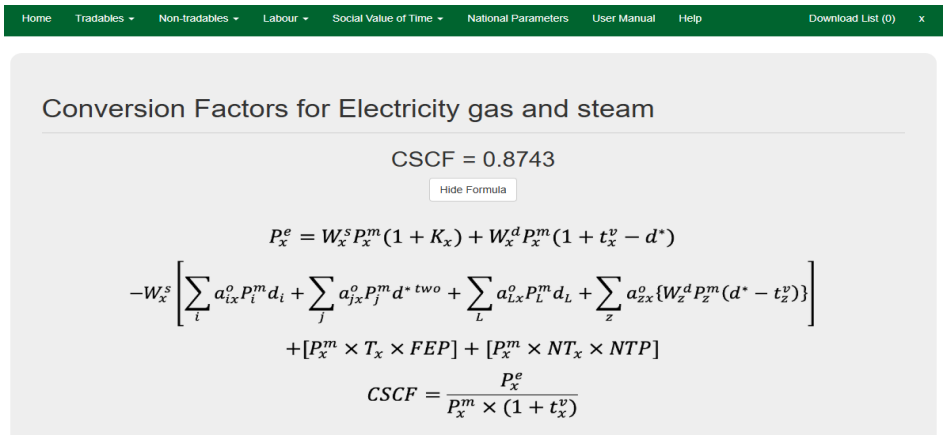

Figure 15: Show Formula Button Expanded (Non-Tradable Section)

Show Formula will reveal the estimation formula for the commodity type.

Hide Formula hides the currently expanded formula.

The table allows a user to input different variables and recalculate to display a new estimation result.

Base Input Values are calculated using the base input values as of the designated year.

Recalculate commits the Updated Input Values to the formulation and displays the estimation with the updated values.

Reset allows resetting of the inputted values for the estimation results.

Add to Download List allows users to save their estimation results to an excel file which can be downloaded by pressing the "Download List" from the top menu.

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Labour

Economic Opportunity Cost of Labour (EOCL) for seven categories of labour with different range of skills and labour market types has been estimated for Zambia.

Figure 16: EOCL Menu Items

Once a user selects a labour category, they will be redirected to the page where they can see the estimation results (i.e., EOCL, CF, Ratio of Labour Externality, Labour Benefits, and Fiscal Benefits) as well as options for the user to practice estimations by inputting values into the table.

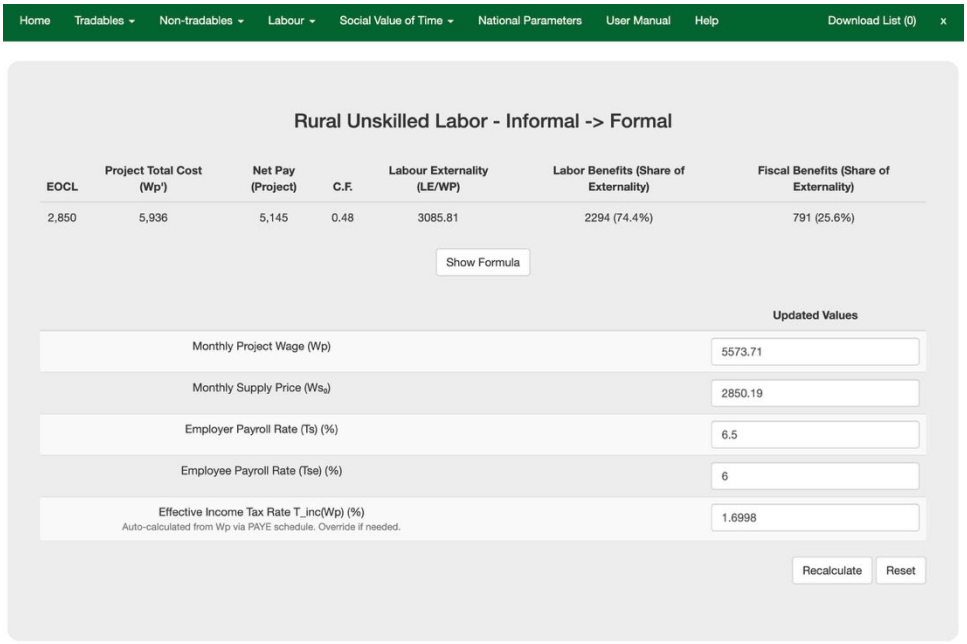

Figure 17: EOCL Estimation Page

Show Formula will reveal the estimation formula for the Economic Opportunity Cost of Labour.

Hide Formula hides the currently expanded formula.

The table allows a user to input different variables and recalculate to display a new estimation result.

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Base Input Values are used to calculate estimation results.

Recalculate commits the Updated Input Values to the formulation and displays the estimations with the updated values.

Reset allows resetting of the input values for the estimation results.

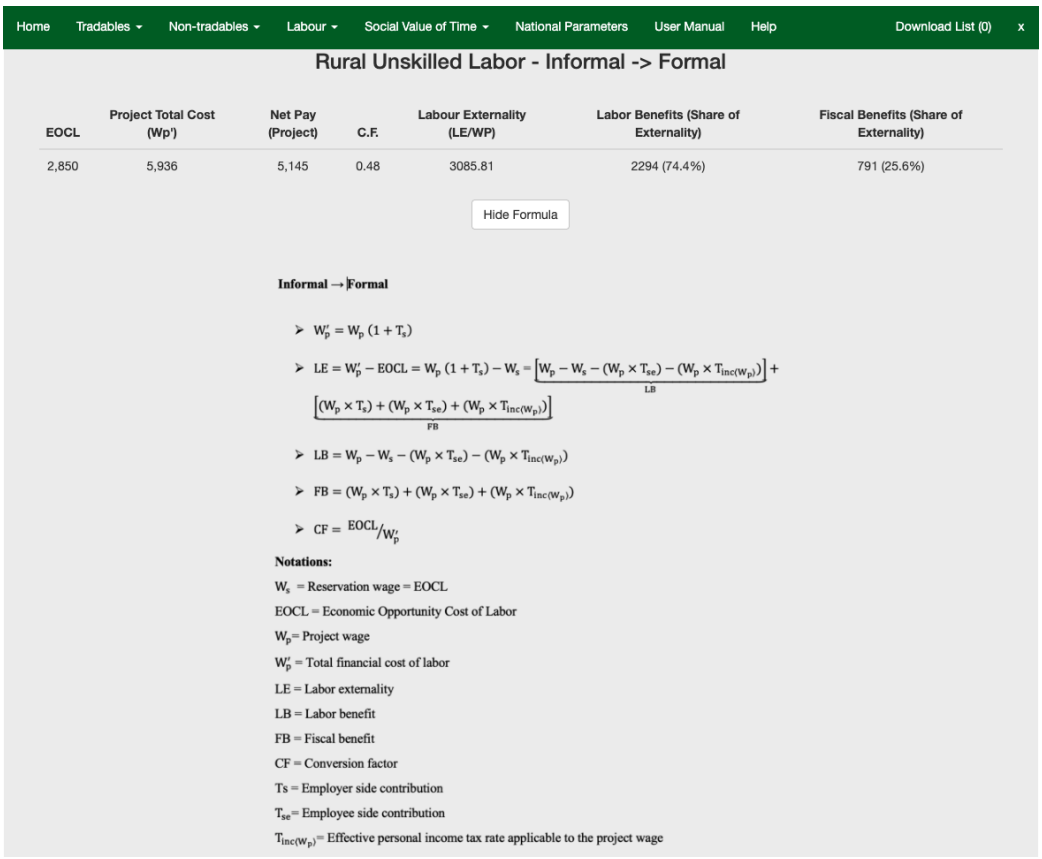

Figure 18: Show Formula Button Expanded (EOCL Section)

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Social Value of Time

Social Value of Time for four categories has been estimated for Zambia.

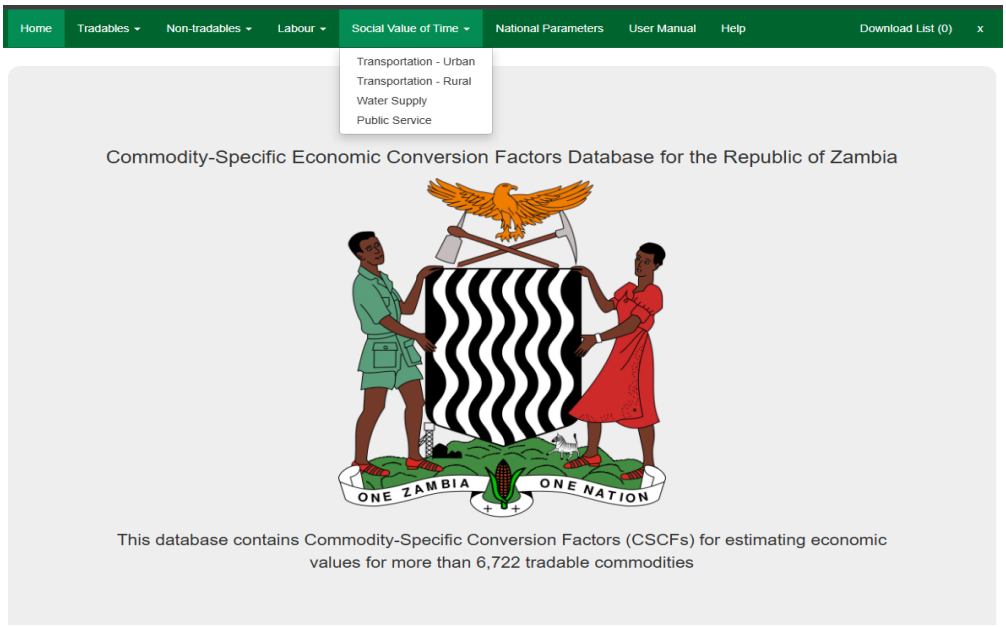

Figure 19: Social Value of Time landing page

Once a user selects a category, they will be redirected to the page where they can see the estimation results (i.e., Type, Real SVT per vehicle hour (Project Base Year), Real SVT per vehicle hour (Road Commencement Year)) as well as options for the user to practice estimations by inputting values into the table.

Show Formula will reveal the estimation formula for the Social Value of Time.

Hide Formula hides the currently expanded formula.

The table allows a user to input different variables and recalculate to display a new estimation result.

Base Input Values are used to calculate estimation results.

Recalculate commits the Updated Input Values to the formulation and displays the estimations with the updated values.

Reset allows resetting of the inputted values for the estimation results.

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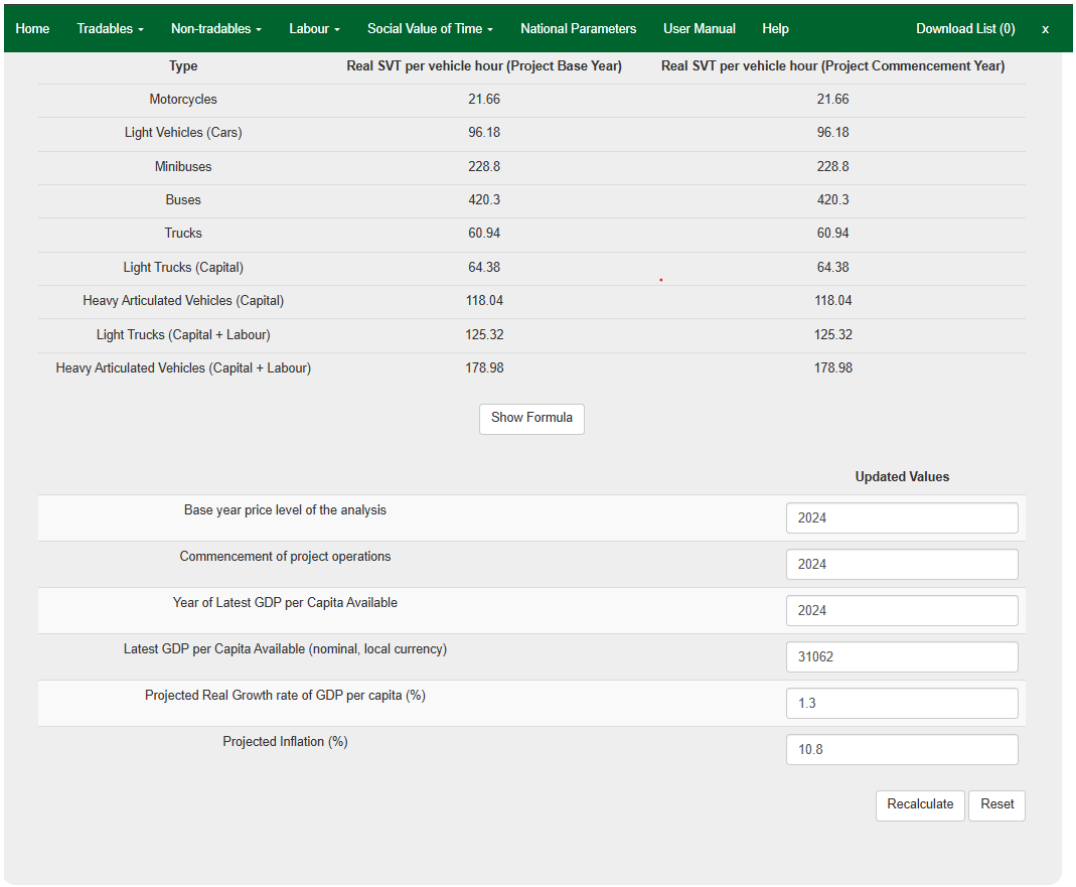

Figure 20: Social Value of Time Estimation Page

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Heavy Articulated Vehicles (Capital)	118.04	118.04
Light Trucks (Capital + Labour)	125.32	125.32
Heavy Articulated Vehicles (Capital + Labour)	178.98	178.98

Hide Formula

Calculating the Social Value of Time

$$SVT_n = SVT_{n-1}\left(\frac{NPCGDP_n}{NPCGDP_b}\right)$$

$$NPCGDP_n = Real\ NPCGDP \times \left((1+i)^{n-b}\right)$$

$$Real\ NPCGDP = NPCGDP_b \times \left((1 + Projected\ Real\ Growth\ Rate\ of\ GDP\ per\ Capita)^{n-b}\right)$$

Notations:

SVT_n:	Social Value of time for the current period
SVT_{n-1}:	Social Value of time for the previous period
$NPCGDP_n$:	Nominal Per Capita Gross Domestic Product for the current period
$NPCGDP_b$:	Nominal Per Capita Gross Domestic Product base period
i:	Projected Inflation

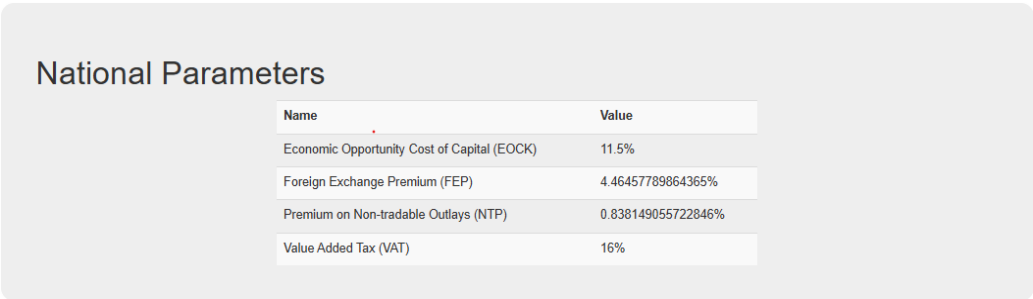
Note: (b) is the period in which the latest data on Per Capita Gross Domestic Product is available

Updated Values

Figure 21: Show Formula Button Expanded

National Parameters

National Parameters are displayed on this page. Only the Administrator of the database can permanently update the National Parameters. As described earlier, users can temporarily update the parameters in calculation pages for simulation purposes.



National Parameters

Name	Value
Economic Opportunity Cost of Capital (EOCK)	11.5%
Foreign Exchange Premium (FEP)	4.46457789864365%
Premium on Non-tradable Outlays (NTP)	0.838149055722846%
Value Added Tax (VAT)	16%

Figure 22: National Parameters Page

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Us e of Conversion Factors in Project Appraisal

Why Use Conversion Factors

Economic prices account for the real resources consumed or produced by a project and hence do not include tariffs, taxes or subsidies as these are merely transfers between consumers, producers and the government all within the same economy. Financial prices are market prices, which naturally incorporate all the tariffs, taxes and subsidies.

In project appraisal, the difference between the financial and economic values of inputs and outputs should be emphasized particularly when distortions exist on either the demand or supply side of markets for these goods and services. These distortions, which are caused by trade taxes and subsidies as well as other indirect taxes (such as the value-added tax-VAT), drive a wedge between financial and economic prices of goods and services. The concept of a conversion factor, defined as the ratio of the economic price to the financial price, can play an important role in determining the economic costs or benefits of a project and in measuring the divergence between the prices.

Since a CSCF is the ratio of the economic price of a commodity to its financial price, the economic price of any commodity can be determined by multiplying the CSCF of that commodity times its financial price. Zambia CSCF helps the user identify the CSCF that is then used to estimate the economic price of the commodity as part of the economic appraisal of the investment under analysis.

$$\text{CSCF} = \frac{\text{Economic Price}}{\text{Financial Price}}$$

$$\Downarrow$$

$$\text{Economic Price} = \text{Financial Price } x \text{ CSCF}$$

Different Types of Conversion Factors

Buying or Producing the Commodity

The CSCF is the ratio of a commodity's economic price to its financial price. While the economic price of a commodity will be the same whether the project is producing this

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commodity as an output or using it as an input, the financial prices could differ from one case to another.[3]

For example, an excise tax (duty) levied on a certain good or the more general VAT will increase the financial price paid by consumers (demand price) but will not affect the cost to producers (supply price). If the project is using (buying) the commodity, the relevant financial price to the project will be the demand price and the CSCF will be given the notation $CSCF_{II}$ or $CSCF_{EI}$ depending on whether the demanded good is an importable (importable input, II) or exportable (exportable input, EI) commodity. Alternatively, if the project is producing (selling) the commodity, the relevant financial price would be the supply price and the commodity-specific conversion factor will be given the notation $CSCF_{IO}$ or $CSCF_{EO}$, i.e., importable output (IO), exportable output (EO). For non-tradables, however, as there is no difference between the CSCF for inputs and outputs, only the notation CSCF is used.[4]

Tradable vs. Non-Tradable

While the methodology used for the estimation of internationally tradable goods is the same as that of internationally non-tradable goods and services, the resulting formulas for the estimation of the conversion factors are different. We provide below definitions for tradable and non-tradable goods and services.

A good or service is considered **tradable** when an increase in demand (supply) by a project does not affect the amount demanded (supplied) by domestic consumers (producers). The increase in demand (supply) by a project is eventually reflected as an increase (decrease) in imports or a decrease (increase) in exports depending on whether the project is demanding or supplying the importable or exportable commodity.

Zambia's **importable** goods include (a) all goods imported into Zambia and (b) all goods produced and sold domestically that are close substitutes for either the imported goods or potentially imported goods. An increase in demand for an importable commodity by a project results in an increase in demand for imports. Alternatively, when a project produces an importable commodity, there will be a reduction in imports.

Zambia's **exportable** goods include (a) all goods exported by Zambia and (b) domestic consumption of similar or close substitutes for the exported goods. An increase in

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demand for an exportable commodity by a project results in a reduction in exports, while the production of an exportable by a project will result in an increase in exports.

A commodity or service is "**non-tradable**" from Zambia's point of view if its domestic price lies above its free on board (FOB) export price or below its cost, insurance, and freight (CIF) import price. The international transportation cost may be very high compared to the value of the product so that no profitable trade is feasible. Alternatively, an importable good will become non-tradable if it receives such a high level of protection in the form of trade quotas or prohibitive tariffs that no import transactions will take place.

Labour

The measurement of the economic benefits from the jobs created by a project is an important component of the economic appraisal of the investment. When a project hires a person, the economic benefits are estimated based on the difference between the total cost to the project of employing this person and the economic opportunity cost of the labor (EOCL) of this individual. The concept of EOCL emerged from the fact that using a person (a resource) for one project implies that the individual is giving up other opportunities that would utilize their time. These workers express this economic cost in the minimum wage rate they require to accept employment in the specific project. In addition, there are other cost and benefit externalities from employment, such as taxes and subsidies, that must be accounted for when estimating the economic opportunity cost of employing a person in a specific project.

Social Value of Time

There are many instances where public sector projects can potentially lead to time savings for citizens and firms in a country. Such projects either facilitate better utilization of existing capital stocks (e.g., road improvement projects and projects reducing the time required to obtain public services) or provide public services to areas without access to those services (e.g., water supply and sanitation projects).

Given that individuals can reallocate time savings to other welfare-improving activities, the social value of time saved by a project adds up to the project's total benefits. The social value of time is made up of two components: the resource value of time, which can be traded off

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with income (the value of working time saved), and the value of the utility derived from the time that now can be spent on other income- or non-income-generating activities.

Equations for Estimating Conversion Factors

Tradables

Importable Commodities

For importable commodities, and assuming the only direct distortions are due to import tariffs and other taxes such as excise and value-added taxes, the CSCF measured at the port (i.e., before considering transportation and handling costs) for a project importing a commodity to use as an input (importable input, II) can be calculated as follows:

$$CSCF_{II} = \frac{1 + FEP}{1 + T_m - K_m + T_e \times (1 + T_m - K_m) + VAT \times \left(1 + T_m - K_m + T_e(1 + T_m - K_m)\right) + T_s}$$

Where,

- II – Importable Input
- IO – Importable Output
- FEP - the Foreign Exchange Premium
- T_m - the rate of Import Duty levied on the CIF price of the imported input
- K_m – the rate of Import Subsidy expressed as the percentage of the CIF price
- T_e - the rate of Excise Duty levied on the CIF price plus the import duty on the imported input (retail price excluding VAT)
- T_s - the rate of the Surtax levied on the CIF price
- VAT - the rate of Value-added tax levied based on the sum of CIF price plus import duty and excise duty.

The CSCF measured at the port (i.e., before considering transportation and handling costs) for a project producing an import substitute (importable output, IO) measured at the port can be calculated as follows:

$$CSCF_{IO} = \frac{1 + FEP}{1 + T_m - K_m + T_e \times (1 + T_m - K_m) + VAT \times \left(1 + T_m - K_m + T_e(1 + T_m - K_m)\right) + T_s}$$

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Exportable Commodities

For exportable goods, and assuming the only direct distortions levied on the commodity are due to an export subsidy or export tax and a value-added tax, the CSCF measured at the port (i.e., before considering transportation and handling costs) for a project producing an exportable commodity (exportable output, EO) will be estimated as follows:

$$CSCF_{EO} = \frac{1 + FEP}{(1 + K_x - T_x)}$$

Where,

- EI – Exportable Input
    - EO – Exportable Output
- FEP - the Foreign Exchange Premium
- K_x - the rate of Export Subsidy (expressed as the percentage of the FOB price)
- T_x - rate of Export Tax (expressed as the percentage of the FOB price)

The CSCF measured at the port (i.e., before considering transportation and handling costs) for a project using an exportable good as an input (exportable input, EI, i.e., a good that would have otherwise been exported) can be calculated as follows:

$$CSCF_{EI} = \frac{1 + FEP}{1 + K_x - T_x + VAT(1 + K_x - T_x)}$$

The only difference between the conversion factors for exportable inputs and exportable outputs is the value-added tax. If a project is using an exportable input, the financial price to the project will include the value-added tax. If, on the other hand, a project is producing a good for export, the supply price to this project will not include the VAT.

Non-tradables

The number of non-tradable commodities in any economy is typically much smaller than that of tradable commodities. Here in this case, CSCFs were estimated for 14 non-tradable items.

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The general formula for the estimation of the economic prices of non-tradable goods and services has the following form:

$$P_x^e = W_x^s P_x^m (1 + K_x) + W_x^d P_x^m (1 + t_x^v - d^*)$$
$$-W_x^s \left[\sum_i a_{ix}^o P_i^m d_i + \sum_j a_{jx}^o P_j^m d^{*\,two} + \sum_L a_{Lx}^o P_L^m d_L + \sum_z a_{zx}^o \{W_z^d P_z^m (d^* - t_z^v)\} \right]$$
$$+[P_x^m \times T_x \times FEP] + [P_x^m \times NT_x \times NTP]$$
$$CSCF = \frac{P_x^e}{P_x^m \times (1 + t_x^v)}$$

Where,

- x : Non-tradable output produced or purchased by the project
- P_x^e : Economic price of output x
- W_x^s : Supply weight for output x
- W_x^d : Demand weight for output x $(W_x^d + W_x^s = 1)$
- P_x^m : Market price per unit of output x (net of value-added tax, i.e., VAT)
- k_x : The rate of production subsidy on output x
- t_x^v : VAT on output x
- d^* : The overall effective tax rate on tradable and non-tradable goods and services in the economy
- a_{ix}^o : Input-output coefficient for tradable input i used in the production of a unit of output x
- P_i^m : Market price per unit of input i (net of VAT)
- d_i : The rate of non-creditable tax or subsidy on the tradable inputs used in the production of output x
- a_{jx}^o : Input-output coefficient for tradable input j used in the production of non-tradable inputs (direct tradable inputs to the NT inputs and the indirect tradable inputs of their subsequent inputs) used for the production of a unit of output x
- P_j^m : Market price per unit of j
- $d^{*\,two}$: The overall average effective tax rate of the tradable inputs (in the whole economy) used indirectly in the non-tradable inputs for the production of output x excluding VAT.
- a_{Lx}^o : Input-output coefficient for direct and indirect labor input L used in the production of a unit of output x
- P_L^m : Market price per unit of labor L
- d_L : The rate of distortions on the labor inputs used in the production of output x
- a_{zx}^o : Input-output coefficient for non-tradable input z (direct input) used in the production of a unit of output x
- W_z^d : Demand weight for input z
- P_z^m : Market price per unit of input z (net of VAT and distortions on tradable components of input z)
- t_z^v : VAT on input z paid by the new consumers of z
- T_x :Share of tradable components for output x
- NT_x : Share of non-tradable (i.e., Labor) components of output x $(T_x + NT_x = 1)$
- FEP : Foreign exchange premium
- NTP : Premium on non-tradable outlay

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In line with the case of tradables, CSCF for non-tradables can be calculated as follows:

$$CSCF = \frac{\text{Economic Price}}{\text{Financial Price}} = \frac{P_x^e}{P_x^m \times (1+t_x)}$$

$$\Downarrow$$

$$\text{Economic Price} = \text{Financial Price } x \text{ CSCF}$$

Labour

The estimation of the EOCL depends on several dimensions of labour market heterogeneity. In this toolkit, the valuation of labour varies according to the worker's skill category (skilled versus unskilled), geographic location (rural versus urban), employment status and recruitment pathway (formal versus informal sector origin and destination), and nationality (domestic versus foreign labour). The framework covers five broad labour categories: rural unskilled, urban unskilled, rural skilled, urban skilled, and foreign skilled labour. Within the domestic labour categories, the analysis distinguishes among three analytically relevant labour-market transitions: formal-to-formal, informal-to-formal, and informal-to-informal employment. Across all cases, project employment is assumed to be permanent, and the project wage is assumed to exceed the worker's reservation wage through the inclusion of a recruitment premium sufficient to attract and retain labour of the required skill category, consistent with the supply price approach to labour valuation. The framework further incorporates the fiscal, institutional, and externality implications associated with different labour-market transitions, including taxation, statutory payroll contributions, labour formalization effects, migration-related costs in urban settings, and foreign exchange considerations for internationally recruited labour.

Rural Unskilled Labour

Rural unskilled labour in Zambia represents a relatively straightforward but institutionally important case because employment is dominated by informal labour arrangements characterized by low earnings, limited job security, and minimal integration into the formal tax and social protection system. For most workers, the relevant counterfactual is informal employment, where earnings are typically received

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free of personal income tax liabilities and without mandatory payroll deductions or employer contributions to statutory schemes such as NAPSA, NHIMA, or the Skills Development Levy. When project employment remains informal, no social security obligations apply and the economic evaluation centers primarily on the income foregone in alternative informal activities. However, when workers transition into formal project employment, the analysis must additionally account for the fiscal consequences of labour formalization, including payroll contributions and personal income taxation. Where workers are recruited from existing formal employment, these fiscal and labour effects must be measured incrementally relative to the worker's prior formal job. Consequently, the economic opportunity cost of rural unskilled labour depends critically on both the worker's sector of origin and the institutional structure of the project job, since movements between informal and formal employment alter not only workers' take-home income but also government revenues and the distribution of gains arising from project hiring.

Scenario A: Formal → Formal

- $W_p' = W_p\,(1 + T_s)$
- $LE = W_p' - W_s\,(1 + T_s) = \underbrace{[W_p\,(1 + T_s)]}_{\text{Project financial cost}} - \underbrace{[W_s\,(1 + T_s)]}_{\text{Counterfactual former cost}}$
- $LB = \underbrace{[W_p - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p \rangle})]}_{\text{Net pay in project job}} - \underbrace{[W_s - (W_p \times T_{se}) - (W_s \times T_{inc\langle W_s \rangle})]}_{\text{Net pay in previous job}}$
- $FB = (W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p \rangle}) - (W_s \times T_s) - (W_s \times T_{se}) - (W_s \times T_{inc\langle W_s \rangle})$
- $CF = {}^{EOCL}/_{W_p'}$

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Scenario B: Informal → Formal

- $W_p' = W_p\,(1 + T_s)$
- $LE = W_p' - EOCL = W_p\,(1 + T_s) - W_s =$
$\underbrace{\left[W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p \rangle})\right]}_{LB} +$
$\underbrace{\left[(W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p \rangle})\right]}_{FB}$
- $LB = W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p \rangle})$
- $FB = (W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p \rangle})$
- $CF = {}^{EOCL}/_{W_p'}$

Scenario C: Informal →Informal

- $LE = W_p - EOCL = LB$
- $FB = 0$
- $CF = {}^{EOCL}/_{W_p}$

Urban Unskilled Labour

This case builds on the rural unskilled labour framework but introduces an additional adjustment associated with urban employment. Here, the opportunity cost of labour must account not only for the worker's foregone earnings but also for the migration-related pressure that urban job creation can place on publicly provided services. As in the rural case, the distinction between formal and informal employment remains important because it determines whether payroll contributions, personal income taxes, and statutory deductions apply. When the project job is in the formal sector, both labour and fiscal benefits must be adjusted to reflect employee and employer social security contributions, as well as any applicable tax obligations. When the worker originates from existing formal employment, these effects are evaluated incrementally relative to the

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previous job. However, unlike the rural case, urban employment introduces an additional social cost component associated with migration-induced public expenditure burdens. Consequently, the EOCL and conversion factors for urban unskilled labour reflect not only differences in labour origin and employment formality but also the broader fiscal implications of urban labour absorption.

Scenario A: Formal → Formal

- $W_p' = W_p\,(1 + T_s)$
- $EOCL = W_s + (W_s \times k_{net})$
- $LE = W_p' - W_s\,(1 + T_s) + (W_s \times k_{net}) = \underbrace{[W_p\,(1 + T_s)]}_{\text{Project financial cost}} - \underbrace{[W_s\,(1 + T_s)]}_{\text{Counterfactual former cost}} + \underbrace{[W_s \times k_{net}]}_{\text{Migration externality cost}}$

  $LB = W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p\rangle}) + (W_s \times T_{se}) + (W_s \times T_{inc\langle W_s\rangle})$
- $FB = (W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p\rangle}) - (W_s \times T_s) - (W_s \times T_{se}) - (W_s \times T_{inc\langle W_s\rangle}) - (W_s \times k_{net})$
- $CF = {}^{EOCL}/_{W_p'}$

Scenario B: Informal → Formal

- $W_p' = W_p\,(1 + T_s)$
- $EOCL = W_s + (W_s \times k_{net})$
- $LE = W_p' - EOCL = W_p\,(1 + T_s) - W_s$

  $= \underbrace{\left[W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p\rangle})\right]}_{LB} + \underbrace{\left[(W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p\rangle}) - (W_s \times k_{net})\right]}_{FB}$
- $LB = W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p\rangle}$
- $FB = (W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p\rangle}) - (W_s \times k_{net})$

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- $CF = {}^{EOCL}/_{W_p'}$

Scenario C: Informal →Informal

- $EOCL = W_s + (W_s \times k_{net})$
- $LE = W_p - EOCL = LE = \underbrace{(W_p - W_s)}_{LB} + \underbrace{[-(W_s \times k_{net})]}_{FB}$
- $LB = W_p - W_s$
- $FB = -(W_s \times k_{net})$
- $CF = {}^{EOCL}/_{W_p}$

Rural Skilled Labour

This case follows the same analytical structure as the previous labour categories but reflects the institutional and market characteristics associated with skilled labour in rural areas. Here, workers generally command substantially higher wages and are more likely to originate from formal employment arrangements involving statutory payroll contributions, personal income taxation, and social protection coverage. Consequently, the opportunity cost of labour is often based on foregone formal-sector earnings rather than untaxed informal income, although informal skilled employment remains a relevant alternative in some rural contexts. As in the earlier cases, the analysis distinguishes among formal-to-formal, informal-to-formal, and informal-to-informal transitions, since the worker's origin and the institutional nature of the project job determine the magnitude and distribution of labour and fiscal effects. When recruitment occurs into the formal sector, both labour and fiscal benefits must be adjusted for employee and employer statutory contributions, as well as the progressive income tax obligations associated with higher skilled wages. When workers transition from informal into formal skilled employment, labour formalization generates substantial gains through new tax and payroll revenues, whereas movements between formal jobs require an incremental comparison against an already taxed counterfactual position. Overall, the economic valuation of rural skilled labour depends not only on skill-specific wage differentials and employment formality but also on the fiscal implications associated with skilled wages and formal

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employment.

Scenario A: Formal → Formal

- $W'_p = W_p\ (1 + T_s)$
- $LE = W'_p - W_s\ (1 + T_s)$
- $LB = W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p \rangle}) + (W_s \times T_{se}) + (W_s \times T_{inc\langle W_s \rangle}$
- $FB = (W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p \rangle}) - (W_s \times T_s) - (W_s \times T_{se}) - (W_s \times T_{inc\langle W_s \rangle})$
- $CF = {}^{EOCL}/_{W'_p}$

Scenario B: Informal → Formal

- $W'_p = W_p\ (1 + T_s)$
- $LE = W'_p - EOCL = W_p\ (1 + T_s) - W_s = LE = \underbrace{\left[W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p \rangle})\right]}_{LB} + \underbrace{\left[(W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p \rangle})\right]}_{FB}$
- $LB = W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p \rangle})$
- $FB = (W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p \rangle})$
- $CF = {}^{EOCL}/_{W'_p}$

Scenario C: Informal →Informal

- $LE = W_p - EOCL = LB$
- $FB = 0$
- $CF = {}^{EOCL}/_{W_p}$

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Urban Skilled Labour

This case is similar to the previous skilled labour case but reflects the higher wage levels and corresponding differences in effective income tax rates associated with urban labour markets. Here, skilled workers are generally already established within metropolitan labour markets, and migration-related externalities are therefore not considered. As in the previous cases, the analysis distinguishes between formal-to-formal, informal-to-formal, and informal-to-informal transitions. When the project job is in the formal sector, both labour and fiscal benefits must be adjusted for employee and employer statutory contributions together with the applicable income tax liabilities associated with skilled earnings. When workers are drawn from existing formal employment, these effects are evaluated incrementally relative to the worker's previous position.

Scenario A: Formal → Formal

- $W_p' = W_p\,(1 + T_s)$
- $LE = W_p' - W_s\,(1 + T_s)$
- $LB = W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p \rangle}) + (W_s \times T_{se}) + (W_s \times T_{inc\langle W_s \rangle}$
- $FB = (W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p \rangle}) - (W_s \times T_s) - (W_s \times T_{se}) - (W_s \times T_{inc\langle W_s \rangle})$
- $CF = {EOCL}/{W_p'}$

Scenario B: Informal → Formal

- $W_p' = W_p\,(1 + T_s)$
- $LE = W_p' - EOCL = W_p\,(1 + T_s) - W_s$
- $LB = W_p - W_s - (W_p \times T_{se}) - (W_p \times T_{inc\langle W_p \rangle})$
- $FB = (W_p \times T_s) + (W_p \times T_{se}) + (W_p \times T_{inc\langle W_p \rangle})$
- $CF = {EOCL}/{W_p'}$

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3.5. Scenario C: Informal →Informal

- $LE = W_p - EOCL = LB$
- $FB = 0$
- $CF = {}^{EOCL}/_{W_p}$

Urban Skilled Foreign Formal Sector

This case differs from the domestic labour categories because the worker is recruited from outside the local labour market, typically where projects rely on expatriate expertise to complement domestic skill availability. As in the previous cases, the employment arrangement is formal, requiring the incorporation of personal income taxation and statutory payroll contributions into the labour cost framework. However, unlike domestic labour, the economic valuation of foreign skilled labour places greater emphasis on the domestic welfare implications associated with the employment of non-resident workers. Part of the worker's net earnings is assumed to be remitted abroad, creating a foreign exchange cost to the domestic economy, while the portion of income spent locally generates fiscal gains through indirect taxation. The framework also incorporates the public and administrative costs associated with hosting foreign labour. Consequently, the EOCL for foreign skilled labour reflects the interaction between taxes, payroll contributions, remittance leakages, foreign exchange effects, domestic expenditure effects, and hosting-related public costs. In this setting, the economic gains associated with project employment arise largely through fiscal and domestic expenditure channels rather than through direct labour benefits to the foreign worker.

- $EOCFL = W_f(1 - T_h) - W_f(1 - T_h)(1 - V)T_{vat} + W_f(1 - T_h)V\left(\frac{E_e}{E_m} - 1\right) + kW_f$
- $LE = Wp' - EOCFL = W_f(1 - T_s) - \left[W_f(1 - T_h) - W_f(1 - T_h)(1 - V)T_{vat} + W_f(1 - T_h)V\left(\frac{E_e}{E_m} - 1\right) + KW_f\right]$
- $FB = W_f(T_s + T_h) + W_f(1 - T_h)(1 - V)T_{vat} - W_f(1 - T_h)V\left(\frac{E_e}{E_m} - 1\right) - KW_f$

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- $LB = 0$

Notations:

$\frac{E_e}{E_m} - 1$ = Foreign exchange premium
k_{net} = marginal external cost ratio
T_h= Combined income tax and employee social security contribution rate
$T_{inc\langle W_p \rangle}$= Effective personal income tax rate applicable to the project wage
$T_{inc\langle W_s \rangle}$ = Effective personal income tax rate applicable to the reservation wage
T_{se}= Employee side contribution
T_{vat} = Value-added tax
W_f = Project wage paid to foreign workers
W_p= Project wage
W_p' = Total financial cost of labour
W_p = Project wage
W_s = Reservation wage
CF = Conversion factor
EOCL = Economic Opportunity Cost of Labour
FB = Fiscal benefit
k = Gross external cost ratio
LB = Labour benefit
LE = Labour externality
Ts = Employer side contribution
V = Share of income typically remitted to the home country of the foreign worker

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Case: Skilled workers are hired to work in the temporary formal sector

$$P_x^e = W_s(1 - T) + \left(\frac{H_d}{P_t}\right) \times (W_a T' + (1 - P_t) \times fU) + H_t W_t(T') + H_s \left(\frac{1 - P_t}{P_t}\right) fU$$

$$W_{p'} = W_p\ (1 + T_s)$$

$$\text{CSCF} = \frac{P_x^e}{W_{p'}}$$

Notations:

x:	Labor category employed by the project
P_x^e:	Economic price of the labor category
W_p:	Gross of tax monthly project wage for labor
$W_{p'}$:	Total labor compensation
T:	Combined effective income tax rate plus social security contributions paid by employees on the supply price of labor and the project wage
f:	The proportion of time an unemployed worker expects to collect unemployment benefits
U:	Unemployment insurance benefits
H_s:	Share of the project's labor sourced from out of labor force
H_t:	Share of the project's labor sourced from alternative jobs in the temporary sector
T':	Total effective tax rate, including both the income tax rate and the social security taxes (Ts+ Tse) on the alternative wage rates
W_t:	Temporary Alternative Wage rate
P_t:	The proportion of time a member of the temporary sector worker expects to be employed during a calendar year
W_a:	Permanent Alternative Wage rate
H_d:	Share of the project's labor sourced from alternative jobs in the permanent sector
W_s:	Gross of income tax supply price of labor
T_s:	Social security tax rate paid by employer

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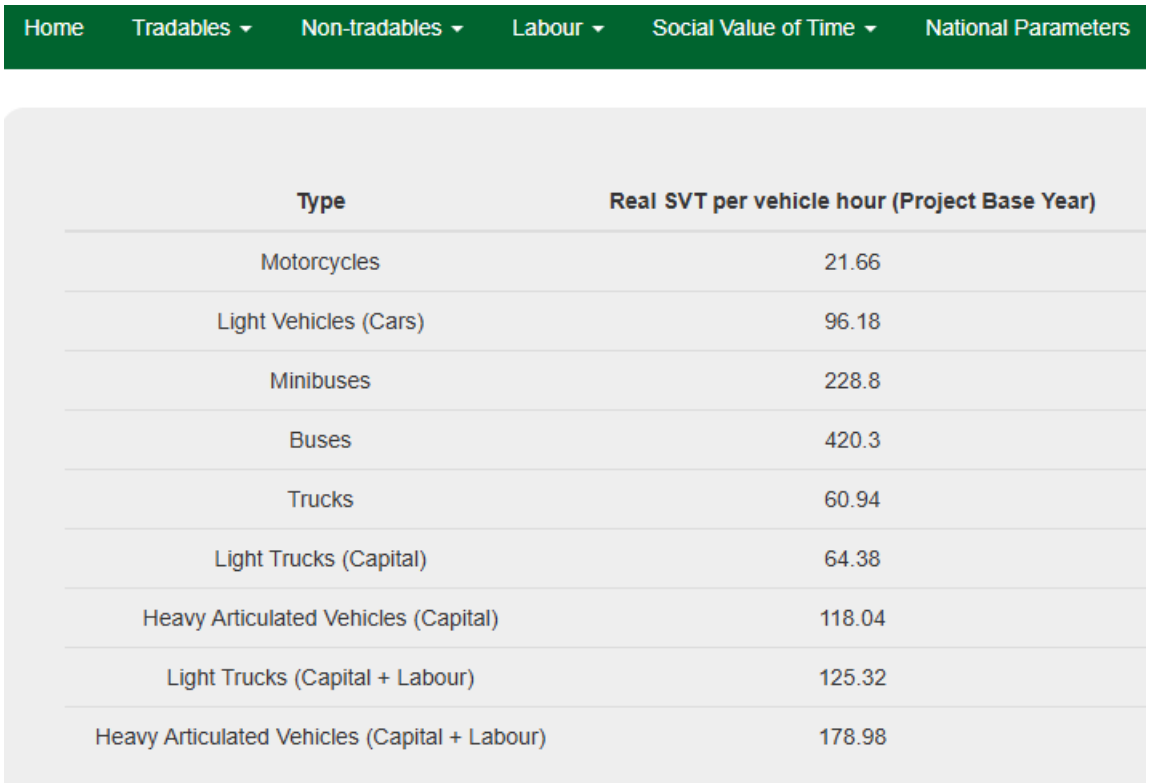
Social Value of Time

Transportation -Urban

These estimated SVTs are representative of the Social Value of Time for different vehicle modes. When appraising road investment projects, the economic benefits of time savings are assessed by comparing travel times **without** and **with** the project for different vehicle modes. Therefore, the estimates for each representative vehicle mode should be disaggregated by multiplying the SVT per vehicle hour by the projected traffic volume for each corresponding vehicle type.



Type	Real SVT per vehicle hour (Project Base Year)
Motorcycles	21.66
Light Vehicles (Cars)	96.18
Minibuses	228.8
Buses	420.3
Trucks	60.94
Light Trucks (Capital)	64.38
Heavy Articulated Vehicles (Capital)	118.04
Light Trucks (Capital + Labour)	125.32
Heavy Articulated Vehicles (Capital + Labour)	178.98

Figure 23: SVT Transportation Estimates – Urban Region

Transportation- Rural

The same methodology is applied for rural regions, while rural reference wages are derived using an urban-to-rural wage ratio of 1.5.

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Type	Real SVT per vehicle hour (Project Base Year)
Motorcycles	14.45
Light Vehicles (Cars)	64.13
Minibuses	152.64
Buses	280.2
Trucks	40.64
Light Trucks (Capital)	64.38
Heavy Articulated Vehicles (Capital)	118.04
Light Trucks (Capital + Labour)	105.02
Heavy Articulated Vehicles (Capital + Labour)	158.68

Figure 24: SVT Transportation Estimates – Rural Region

Projecting SVT Values for Projects Starting Beyond the Base Year

In some cases, project appraisal must be conducted for projects that come into service in a future period rather than the base year. Therefore, the estimated SVT values for the base year must first be rebased to the project's starting year before any further projections are made.

Rebasing is carried out by multiplying the base year SVT by the ratio of the Nominal Per Capita GDP of the new base year (n) to the Nominal Per Capita GDP of the existing base year (b), as follows:

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$$SVT_n = SVT_{n-1}\left(\frac{NPCGDP_n}{NPCGDP_b}\right)$$

$$NPCGDP_n = Real\ NPCGDP \times \left((1+i)^{n-b}\right)$$

$$Real\ NPCGDP = NPCGDP_b \times \left((1 + Projected\ Real\ Growth\ Rate\ of\ GDP\ per\ Capita)^{n-b}\right)$$

Notations:

SVT_n:	Social Value of time for the current period
SVT_{n-1}:	Social Value of time for the previous period
$NPCGDP_n$:	Nominal Per Capita Gross Domestic Product for the current period
$NPCGDP_b$:	Nominal Per Capita Gross Domestic Product base period
i:	Projected Inflation

Note: (b) is the period in which the latest data on Per Capita Gross Domestic Product is available

Figure 25: SVT Transportation Show Formula Expanded

[1] The Harmonized Commodity Description and Coding System, generally known as the Harmonized System (HS) is used by the World Customs Organization (WCO) as an internationally standardized system of names and numbers to classify traded products. [2] See the second section of the manual for details

Water supply

In this section, we review the current provision of water and sanitation services across Zambia. A standard approach to estimate the economic value of time savings due to improved access to water and sanitation facilities is to conduct surveys to collect individual-level information about households' needs and preferences. Also, detailed surveys provide us with the distribution of households with respect to their opportunity costs of time. In the absence of such data, however, the project analyst can use community- or regional-level data to approximate the distribution of households' time preferences and the monetary value of the time savings. The estimated SVT values for water and sanitation services are presented in the Figure below. The estimates are reported as a lower and upper bound, reflecting the range of likely outcomes depending on how beneficiaries reallocate their recovered time. The lower bound applies 30 percent of the local unskilled hourly wage for adults and 15 percent for children, representing a conservative scenario where recovered time is largely redirected toward non-productive activities such as leisure. The upper bound applies 50 percent for adults and 25 percent for children, capturing a more optimistic scenario where a greater share of recovered time is reallocated toward productive or income-generating activities.

Type	Real SVT (Project Base Year)
Adults (Upper Bound)	10.38
Adults (Lower Bound)	6.23
Children (Upper Bound)	5.19
Children (Lower Bound)	3.11

Figure 26: SVT Water Supply Estimates

Projecting SVT Values for Projects Starting Beyond the Base Year

In some cases, project appraisal must be conducted for projects that come into service in a future period rather than the base year. Therefore, the estimated SVT values for the base year must first be rebased to the project's starting year before any further projections are made.

Rebasing is carried out by multiplying the base year SVT by the ratio of the Nominal Per Capita GDP of the new base year (n) to the Nominal Per Capita GDP of the existing base year (b), as follows:

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$$SVT_n = SVT_{n-1}\left(\frac{NPCGDP_n}{NPCGDP_b}\right)$$

$$NPCGDP_n = Real\ NPCGDP \times \left((1+i)^{n-b}\right)$$

$$Real\ NPCGDP = NPCGDP_b \times \left((1 + Projected\ Real\ Growth\ Rate\ of\ GDP\ per\ Capita)^{n-b}\right)$$

Notations:

SVT_n:	Social Value of time for the current period
SVT_{n-1}:	Social Value of time for the previous period
$NPCGDP_n$:	Nominal Per Capita Gross Domestic Product for the current period
$NPCGDP_b$:	Nominal Per Capita Gross Domestic Product base period
i:	Projected Inflation

Note: (b) is the period in which the latest data on Per Capita Gross Domestic Product is available

	Updated Values
Base year price level of the analysis	2024
Commencement of project operations	2024
Year of Latest GDP per Capita Available	2024
Latest GDP per Capita Available (nominal, local currency)	31062
Projected Real Growth rate of GDP per capita (%)	1.3
Projected Inflation (%)	10.8

Figure 27: SVT Water Supply Show Formula Expanded

Public Service

In this section, we briefly review public attitudes toward the current quality of public service delivery in Zambia, and then we estimate the monetary value of time savings for citizens and business enterprises due to reduced turnaround times. For this purpose, we categorize those who are looking for public services into two groups: (1) those visiting public offices for personal purposes, such as visiting public health facilities for medical treatments; and (2) those visiting public offices for commercial purposes, such as to obtain licenses, to renew permits, or to pay business taxes. The estimated SVT values for each group are presented in the figure below. For personal visits, the monetary value of time savings is estimated as a range, with the lower bound set at 30 percent of the reference wage, representing a conservative scenario where recovered time is redirected toward non-productive activities, and the upper bound set at 50 percent, reflecting a scenario where a greater share of time is reallocated toward productive activities. For commercial visits, the full reference wage is applied, as time spent accessing government administrative services is treated as directly foregone productive or working time.

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Type	Real SVT (Project Base Year)
Non-Commercial (Lower Bound)	13.66
Non-Commercial (Upper Bound)	22.76
Commercial	45.51

Figure 28: SVT Public Service Estimates

Projecting SVT Values for Projects Starting Beyond the Base Year

In some cases, project appraisal must be conducted for projects that come into service in a future period rather than the base year. Therefore, the estimated SVT values for the base year must first be rebased to the project's starting year before any further projections are made.

Rebasing is carried out by multiplying the base year SVT by the ratio of the Nominal Per Capita GDP of the new base year (n) to the Nominal Per Capita GDP of the existing base year (b), as follows:

$$SVT_n = SVT_{n-1}\left(\frac{NPCGDP_n}{NPCGDP_b}\right)$$

$$NPCGDP_n = Real\ NPCGDP \times \left((1+i)^{n-b}\right)$$

$$Real\ NPCGDP = NPCGDP_b \times \left((1 + Projected\ Real\ Growth\ Rate\ of\ GDP\ per\ Capita)^{n-b}\right)$$

Notations:

SVT_n:	Social Value of time for the current period
SVT_{n-1}:	Social Value of time for the previous period
$NPCGDP_n$:	Nominal Per Capita Gross Domestic Product for the current period
$NPCGDP_b$:	Nominal Per Capita Gross Domestic Product base period
i:	Projected Inflation

Note: (b) is the period in which the latest data on Per Capita Gross Domestic Product is available

	Updated Values
Base year price level of the analysis	2024
Commencement of project operations	2024
Year of Latest GDP per Capita Available	2024
Latest GDP per Capita Available (nominal, local currency)	31062
Projected Real Growth rate of GDP per capita (%)	1.3
Projected Inflation (%)	10.8

Figure 29: SVT Public Service Show Formula Expanded

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Developing Team

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Abdallah Othman	Estimation of National Parameters
Godwin Olasehinde-Williams	Estimation of EOCL
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