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STRENGTHEN2

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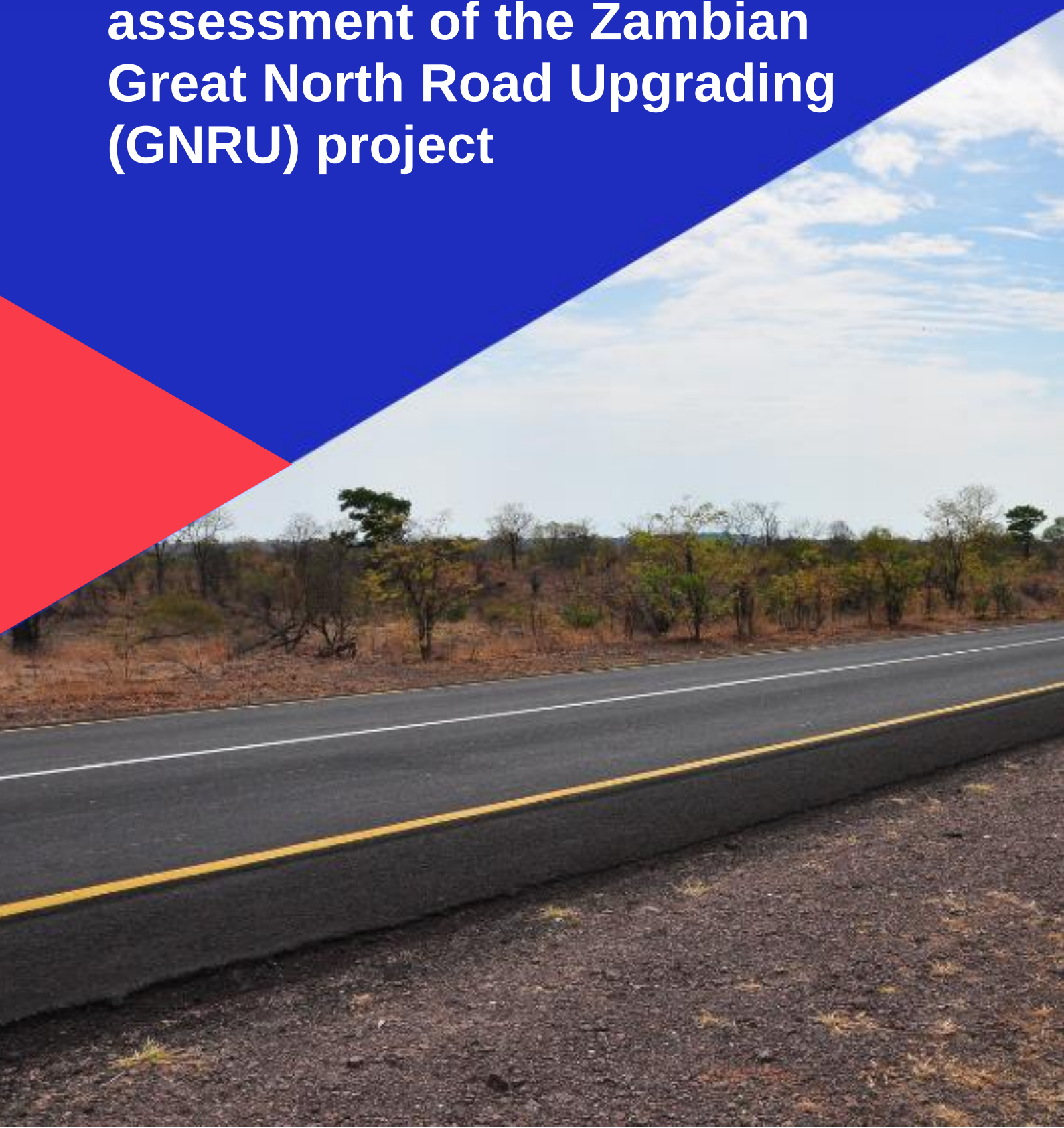
Employment impact assessment of the Zambian Great North Road Upgrading (GNRU) project



Employment impact assessment of the Zambian Great North Road Upgrading (GNRU) project

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International Labour Organization (ILO)

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Acronyms and abbreviations

7NDP	Seventh National Development Plan
8NDP	Eighth National Development Plan
AfDB	African Development Bank
CGE	computable general equilibrium
COMESA	Common Market for Eastern and Southern Africa
CSO	Central Statistical Office
EAC	East African Community
EFSD+	European Fund for Sustainable Development Plus
EGSS	Environmental Goods and Services Sector
EIB	European Investment Bank
EIP	External Investment Plan
ESIA	Environmental and Social Impact Assessment
EU	European Union
GNRU	Great North Road Upgrading
GTAP	Global Trade Analysis project
ICOR	Incremental Output Capital Ratio
ICT	Information Communication Technology
ILO	International Labour Office/Organization
IMF	International Monetary Fund
LCMS	Living Condition Monitoring Survey
LES	Linear Expenditure System
LFS	Labour Force Survey
MLSS	Ministry of Labour and Social Security
MoFNP	Ministry of Finance and National Planning
NAM	National Accounting Matrix
NPISH	non-profit Institutions serving households
NSC	North-South Corridor
PAPs	project-affected peoples
SADC	South African Development Community
SAM	Social Accounting Matrix
SDA	Strategic Development Areas (SDAs)
SEEA	System of Environmental-Economic Accounting
SMSD	Structural Model for Sustainable Development
T2	Trunk Road number 2
TAH 4	Trans-Africa Highway
UNIDO	United Nations Industrial Development Organization
ZMK	Zambia Kwacha

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Executive Summary

The ILO's STRENGTHEN2 project is conducting employment impact assessments of EU-funded investments in sub-Saharan Africa, to promote the creation of more and better jobs. The European Union (EU) is supporting Zambia's Great North Road Upgrading (GNRU) project via its External Investment Plan (EIP). The project aims at fostering regional integration by expanding intra-Africa trade, strengthening growth, and reducing the time and cost of transport along the corridor. Additionally, the project intends to contribute to transforming Zambia from a land-locked to a land-linked country. The project consists of the rehabilitation, widening, and marginal alignment of about 372 km of the road from Mpika to Nakonde in North-Eastern Zambia at the border with the United Republic of Tanzania. The project is currently at the early stage of implementation and the construction phase of the project is expected to start in 2023. The total budget of the project is €435.9 million and the EU contribution is €73.7 million through the EIB.

An ex-ante assessment of the employment impacts of the GNRU project is carried out by conducting simulations using the ILO's Structural Model for Sustainable Development (SMSD). The model builds on the data and structure of the Social Accounting Matrix (SAM) produced jointly by the ILO and the Zambia Statistic Agency (ZamStats) and it contains detailed information on production, income generation and distribution and use of products. The model is calibrated on the SAM as well as other country-level statistics and is characterized by sector-level adjustment mechanisms that reflect features of a low-income commodity-dependent economy. The simulation is conducted to assess the temporary employment impact of the implementation (construction) of the project as well as the permanent employment impacts generated by the expansion of transport sector capacity as the result of the GNRU project.

The ex-ante assessment indicates that the GNRU project can generate a sizable temporary employment impact of 36,222 jobs, the majority of them coming from the construction sector and many belonging to the craft and related trades occupation category. The temporary impacts on employment tend to favour employee profiles characterized by male, non-youth, and formal workers. Some temporary macroeconomic effects of the project also include real GDP and employment growth accompanied by inflation and a slight worsening of the current account balance. All households benefit from a real income growth of around 0.9 per cent.

Once the project is completed and the road is built, the economy benefits from a "capacity effect" in the transportation sector that has spillover effects in the rest of the economy. The capacity effect reduces the output constraint in the transport sector, which pushes the economy to a higher equilibrium with additional output and employment. The employment effect generated by the capacity expansion is "permanent" because it does not depend directly on demand for labour generated by the implementation of the project itself. Using the Incremental Capital Output Ratios (ICOR), the permanent employment effect of the GNRU project is estimated to be 6,813 jobs, with most belonging to the "informal plant and machine operators, and assemblers" occupational category, followed by "formal professionals" and "informal service and sales workers". While the permanent employment generated still exhibits bias against women, youth and informal employment, the extent of gender bias is considerably less, and the bias favouring formal employment is significantly larger. The effects of capacity increase are more diffused across the economy and income groups.

In short, the GNRU project is estimated to have considerable positive employment impacts. Although the employment effects generated by the implementation of the project are considered as "temporary", this does not mean that workers will lose their jobs as the project ends. It is also likely that those workers will benefit from the experience they have gained from this project and continue working elsewhere for other projects. In other words, there might be a capacity effect in skill building that is not modelled, so that many of the jobs as well as the associated economic effects are expected to stay in the economy after the GNRU project ends. The permanent employment impact is also encouraging because those long-term and relatively formal jobs are more likely to be decent work.[1] The estimated gender bias against women in temporary and permanent employment is most concerning, while not extremely surprising given that most jobs generated will be in construction and transport, which traditionally are more male-intensive. Gender bias can be addressed by making the hiring process more female-friendly and the workplace more gender-sensitive, which will ultimately steer the gender composition of the employment generated towards more female employment.

[1] See Decent work indicators (ilo.org) for decent work indicators.

Résumé exécutif

Le projet STRENGTHEN2 de l'OIT réalise des évaluations de l'impact sur l'emploi des investissements financés par l'Union Européenne (UE) en Afrique subsaharienne, afin de promouvoir la création d'emplois plus nombreux et de meilleure qualité. L'UE soutient le projet Great North Road Upgrading (GNRU) en Zambie à travers son plan d'investissement extérieur. Ce projet vise à promouvoir l'intégration régionale en développant le commerce entre les pays d'Afrique, en renforçant la croissance, et en réduisant le temps et le coût de transport le long du corridor. En outre, le projet entend contribuer à faire passer la Zambie d'un pays enclavé à un pays bien connecté. Le projet consiste en la réhabilitation, l'élargissement et l'alignement marginal d'environ 372 km de route entre Mpika et Nakonde dans le nord-est de la Zambie, à la frontière avec la République-Unie de Tanzanie. Le projet est actuellement au début de sa mise en œuvre et la phase de construction du projet devrait commencer en 2023. Le budget total du projet est de 435,9 millions d'euros et la contribution de l'UE est de 73,7 millions d'euros via la Banque Européenne d'Investissement.

Une évaluation ex-ante de l'impact du projet GNRU sur l'emploi est réalisée en effectuant des simulations à l'aide du Modèle Structurel pour le Développement Durable de l'OIT. Le modèle s'appuie sur les données et la structure de la Matrice de Comptabilité Sociale (MCS) produite conjointement par l'OIT et l'Agence Statistique de Zambie, et il contient des informations détaillées sur la production, la génération de revenus ainsi que la distribution et l'utilisation des produits. Le modèle est calibré sur la MCS ainsi que sur d'autres statistiques au niveau du pays et est caractérisé par des mécanismes d'ajustement au niveau sectoriel qui reflètent les caractéristiques d'une économie à faible revenu dépendante des produits de base. La simulation est réalisée pour évaluer l'impact temporaire sur l'emploi de la mise en œuvre (construction) du projet ainsi que les impacts permanents sur l'emploi générés par l'expansion de la capacité du secteur des transports suite au projet GNRU.

L'évaluation ex-ante indique que le projet GNRU peut générer un impact temporaire non négligeable de 36 222 emplois, la majorité d'entre eux provenant du secteur de la construction et beaucoup appartenant à la catégorie professionnelle de l'artisanat et des métiers connexes. Les impacts temporaires sur l'emploi tendent à favoriser des profils d'employés tels que les hommes, les travailleurs âgés et les travailleurs formels. Certains effets macroéconomiques temporaires du projet comprennent également une croissance réelle du Produit Intérieur Brut et de l'emploi accompagnée d'inflation et d'une légère détérioration de la balance des comptes courants. De plus, tous les ménages bénéficieraient d'une croissance du revenu réel d'environ 0,9 pour cent.

Une fois le projet achevé et la route construite, l'économie bénéficie d'un "effet de capacité" dans le secteur des transports qui a des retombées sur le reste de l'économie. L'effet de capacité réduit la contrainte de production dans le secteur des transports, ce qui pousse l'économie vers une trajectoire de croissance plus élevée avec une production poussée et des emplois supplémentaires. L'effet sur l'emploi généré par l'expansion de la capacité est "permanent" car il ne dépend pas directement de la demande de travail générée par la mise en œuvre du projet lui-même. En utilisant les Ratios Incrémentiels de Production de Capital, l'effet permanent sur l'emploi du projet GNRU est estimé à 6 813 emplois, la plupart appartenant à la catégorie professionnelle des "opérateurs informels d'usine, mécaniciens et assembleurs", suivie des "professionnels formels" et des "travailleurs informels des métiers de service et des ventes". Si l'emploi permanent généré présente toujours un biais à l'encontre des femmes, des jeunes et de l'emploi informel, l'ampleur de ce biais est considérablement moindre, et le biais en faveur de l'emploi formel est nettement plus important. Enfin, les effets de l'augmentation de la capacité sont plus diffus dans l'économie et les groupes de revenus.

En résumé, on estime que le projet GNRU aura des effets positifs considérables sur l'emploi. Bien que les effets sur l'emploi générés par la mise en œuvre du projet soient considérés comme "temporaires", cela ne signifie pas que les travailleurs perdront leur emploi à la fin du projet. Il est également probable que ces travailleurs profiteront de l'expérience acquise dans le cadre de ce projet et continueront à travailler ailleurs pour d'autres projets. En d'autres termes, il pourrait y avoir un effet de capacité dans le renforcement des compétences qui n'est pas modélisé, de sorte qu'une grande partie des emplois ainsi que les effets économiques associés devraient rester dans l'économie après la fin du projet GNRU. L'impact sur l'emploi permanent est également encourageant car ces emplois à long terme et relativement formels sont plus susceptibles d'être des emplois décents. Le biais de genre estimé à l'encontre des femmes dans les emplois temporaires et permanents est cependant très préoccupant, bien qu'il ne soit pas extrêmement surprenant étant donné que la plupart des emplois générés seront dans la construction et le transport, qui par nature sont traditionnellement plus masculins. Il est néanmoins possible de remédier à ce déséquilibre en rendant le processus d'embauche plus favorable aux femmes et le lieu de travail plus favorable aux questions de genre, ce qui, en fin de compte, orientera la composition par sexe des emplois générés vers davantage d'emplois féminins.

1. Introduction

STRENGTHEN2 is a joint initiative of the European Union and the ILO with the overall goal of leveraging employment impact assessment to promote the creation of more and better jobs, with the geographic focus on sub-Saharan African countries. An important component of the STRENGTHEN2 project is to conduct a series of in-depth employment impact assessments for the European Fund for Sustainable Development Plus (EFSD+) as well as the External Investment Plan (EIP) projects. The EIP has recently implemented several projects across various sectors in Zambia. One of these is the Great North Road Upgrading (GNRU) project, which aims at fostering regional integration by expanding intra-Africa trade, strengthening growth, and reducing the time and cost of transport along the corridor. More generally, the project intends to contribute to transforming Zambia from a land-locked to a land-linked country. The project consists of the rehabilitation, widening and marginal alignment of about 372 km of the road from Mpika to Nakonde in North-Eastern Zambia at the border with the United Republic of Tanzania. The project was originally intended to commence in 2017 with a total budget of €435.9 million and an EU contribution of €73.7 million through the EIB.

Since the project has been significantly delayed, at the present time it is still in the process of finding the implementers, thus an ex-ante assessment is carried out in this report. The Structural Model for Sustainable Development (SMSD), an economy-wide disaggregated modelling framework developed at the ILO, was used to build and calibrate a country-specific model for Zambia based on its Social Accounting Matrix (SAM), which reflects the socio-economic structure of the economy. The GNRU investment operation is translated into model simulations on temporary and permanent employment impacts based on information from various project documents.

The report is structured as follows: Section 2 provides background information on the social, economic and general development situation in Zambia. Section 3 focuses on key information on the Great North Road Upgrading project. Section 4 introduces the underlying data as well as the assessment model. Section 5 illustrates and discusses the employment impact assessment results. Section 6 concludes the report.

2. Zambia country situation analysis

Zambia is a landlocked country surrounded by eight neighbouring countries. The country experiences a predominantly sub-tropical climate characterized by three distinct seasons: a hot and dry season, a wet rainy season, and a cool dry season. Zambia's land area spans approximately 752,612 square kilometres, with a population of 19.5 million people in 2022 and projected to grow to 27 million by 2035 (see figure A1 in Appendix I). Notably, Zambia has quite a youthful populace, with 83 per cent under the age of 35, out of which 46 per cent are children (0-14 years) and 37 per cent youth (15-35 years (ZamStats 2010).

Zambia has been grappling with macroeconomic instabilities and fiscal constraints in the recent past. Real GDP growth between 2015 and 2018 averaged 3.6 per cent. In 2019 growth was 1.4 per cent before sliding into a recession (-2.8 per cent) in 2020 and then posting recovery to 3.6 per cent in 2021. Further, inflation rose sharply, switching from average single digits (2016 to 2019) to an annual average of 22.1 per cent in 2021 (MoFNP 2022) (see figure A2 in Appendix I).

Fiscal deficits as a share of GDP increased from 5.7 per cent in 2016 to 14.5 per cent in 2020 and dropped to 9.0 per cent in 2021,[2] and this ratio is expected to rise to 9.8 per cent in 2022 (see figure A3 in Appendix I). Zambia has also been buckling under a heavy debt burden over the same period. The total debt as a share of GDP increased from 35 per cent in 2014 to 119 per cent in 2021. Domestic debt increased by 601 per cent to 193 billion Zambia Kwachas (ZMK) in 2021 from ZMK 27.51 billion in 2015. Further, Zambia's domestic arrears stood at ZMK 45.5 billion at the end of September 2021 from ZMK 20.92 billion at the close of 2017. External debt increased further to US$13.04 billion at the end of 2021. The drastic increase of fiscal deficit and external debt in 2020 and 2021 was mainly caused by the Covid pandemic, which has also made a Zambia the world's first Covid-era debt default.

Zambia has experienced industrial growth over the period 2010 to 2018 but the contribution of the manufacturing sector to GDP is limited. As a heavily resource-based economy, Zambia would benefit from further development of value chains to effectively transform raw materials into processed goods (UNIDO 2020). Over the period 2017 to 2021, the wholesale and retail trade sector (20 per cent) accounted for the largest sectoral share of GDP, followed by construction (11 per cent), and mining and quarrying (10 per cent). Conspicuously, manufacturing and agriculture remained low at 8 per cent and 7 per cent respectively (ZamStats 2022) (see table A1 in Appendix II).

The state of infrastructure in Zambia, based on the infrastructure pillar of the 2019 Global Competitiveness Index, remains problematic. In terms of energy, Zambia has 2,800 MW of installed electricity generation capacity, of which 85 per cent is hydro-based. National access to electricity averages 31 per cent, with 67 per cent of the urban and 4 per cent of the rural population having access to power. Notably, the country has made significant road investments in recent years. Budgetary expenditure on roads has outstripped expenditure in other sectors such as rural electrification, and water and sanitation (see figure A4 in Appendix I). As a result, Zambia's score on the 2019 Global Competitiveness Index indicators on road connectivity (77.5) and quality of roads (40.6) was better than the Southern African Development Community (SADC) average of 71.5 and 39.2 (World Economic Forum 2019) (see table A2 in Appendix II).

According to the 2020 Labour Force Survey (LFS) (Annex table 3), Zambia's working-age population (15 years or older) was estimated at 9.9 million in 2020.[3] The size of the labour force was 3.5 million, representing 35 per cent. The youth labour force in 2020 accounted for 1.9 million, representing 54.4 per cent of the overall labour force. Moreover, a total of 1.3 million persons of the population outside the labour force made up potential labour force (ZamStats and MLSS 2020).

Zambia's employed population was estimated at three million in 2020, which makes the employment-to-population ratio 30.2 per cent. Of the total employed population, about a third worked in firms and/or institutions in the formal sector, representing an absolute total of one million. Of interest is the informal sector, defined as referring to all economic activities by workers and economic units that are – in law or in practice – not or insufficiently covered by formal arrangements. In terms of employment in the informal economy by industry in 2020, agriculture, forestry and fishing had the highest percentage share at 33.1 per cent, followed by wholesale and retail trade; repair of motor vehicles and motorcycles accounted for at 23.8 per cent, while water supply, sewerage, waste management and remediation activities had the lowest percentage at less than 1.0 per cent (Zamstats and MLSS 2020). The employed population in the informal and household

[2] Preliminary estimates.

[3] At the time of writing, the 2021 LFS had not been published.

sectors were 45.4 p and 20.7 per cent respectively. Notably, 26.2 per cent of employed persons in 2020 had social security cover at their jobs (i.e. formally employed). The estimated number of informally employed persons was 73.7 per cent.

The unemployment rate was estimated at 13.8 per cent in 2020. Of this number, the male unemployment rate was 11.9 per cent and that of females was higher at 16.4 per cent. Youth unemployment was 19.9 per cent, where 17.6 per cent was for male youth and 22.7 per cent for female youth. Further, 33.5 per cent were in rural areas and 66.4 per cent in urban areas. The combined rate of unemployment and potential labour force was 37.3 per cent, where 44.1 per cent was for females and 31.8 per cent for males (ZamStats and MLSS 2020).

Overall, Zambia's development framework is guided by the Vision 2030 and National Development Plans. Currently, the draft[4] Eighth National Development Plan (8NDP) is expected to provide the strategic direction for the country with four Strategic Development Areas (SDAs): economic transformation and job creation; human and social development; environmental sustainability; and good governance environment (MoFNP 2022b). In terms of infrastructure development in the plan, the development challenges that Zambia faces, while incredibly diverse, all share an underlying need for modern, efficient and reliable infrastructure. In general, the 8NDP, like its predecessor the Seventh National Development Plan (7NDP), makes a strong case for infrastructure development as an enabler of growth. The plan emphasizes the need to maintain, modernize and integrate all transport modes – air, road, rail and water. In the energy subsector, emphasis is placed on instituting reforms to attract private investments, as well as on upgrading electricity transmission infrastructure to minimize transmission losses. The 8NDP also outlines several interventions for enhancing water security including water harvesting, and ground and surface water resources management. Lastly, in the communications subsector, the plan outlines strategies for enhancing digital capacity through investment in ICT infrastructure development and others (MoFNP 2022b). Overall, the priority sectors for investment, growth and job creation articulated in the 7NDP have been maintained in the 8NDP. However, the draft 8NDP differs in structure from the 7NDP, which included specific targets under various developmental outcomes. Nonetheless, the overall development framework remains the same.

[4] The Plan was in draft stage at the time of writing.

3. The Great North Road Upgrading project

The Great North Road (GNR) connects the centrally located and landlocked Zambia with the United Republic of Tanzania and Zimbabwe and is part of three key international routes: the North-South Corridor (NSC) of the South African Development Community (SADC); the Dar Tazara Corridor of the Common Market for Eastern and Southern Africa (COMESA) and the continental Trans-Africa Highway (TAH 4) from Cape to Cairo. The NSC corridor system links in particular eight countries: Botswana, Democratic Republic of Congo (DRC), Malawi, Mozambique, South Africa, United Republic of Tanzania, Zambia and Zimbabwe.

The upgrading of the GNR is a key national project with strong national importance, whose priority has been confirmed by the Zambian Government and by the Tripartite region consisting of the three regional economic communities: COMESA, the East African Community (EAC) and SADC. According to COMESA, the NSC network spans 4,000 km of road, out of which 25 per cent traverses through the GNR in Zambia. In terms of both traffic and freight volumes, it is the busiest transport network across the 27 countries that make up the Tripartite region.

By rehabilitating road infrastructure, this project is supportive of the top national development priorities identified in the 8NDP: an industrialized and diversified economy, enhanced citizenry participation in the economy, and reduced poverty, vulnerability and inequality. The relevance of road infrastructure in Zambia's vision for development is attested by the wealth of initiatives in the sector with a view of transforming Zambia from "landlocked to land-linked".

The project consists of the upgrading, with only marginal changes, to the existing alignment of about 372 km of the single carriageway Zambian GNR, also known as Trunk Road number 2 (T2), linking Mpika and Nakonde in Muchinga Province in North-Eastern Zambia at the border to the United Republic of Tanzania. In addition, the project includes the rehabilitation of about 50 km of feeder road and complementary initiatives in the project area, as well as technical assistance. Thus, the project contains four components: (i) the civil work component that will first upgrade the Mpika to Chinsali section of the GNR (162 km), then the Chinsali to Nakonde section (210 km); (ii) construction supervision conducted by independent consultants; (iii) a resettlement and compensation component which includes the cost of land acquisition and compensation of project-affected peoples (PAPs) in accordance with the Environmental and Social Impact Assessment (ESIA); and (iv) a technical assistance component which involves implementation support, monitoring and evaluation, and sector support.

The total project cost is €434.95 million, most of which goes to the civil works (374.6 million). The EU contribution is €74.39, which complements the financing package to be made available by the EIB and the African Development Bank (AfDB). From a financial perspective, the EU contribution enables the financing gap to be bridged for works and services relating to the upgrading of the Mpika-Chinsali road section. Otherwise, the project would be limited to upgrading the GNR between Chinsali and Nakonde, and if only this section were to be reinforced the Mpika-Chinsali section would remain a serious bottleneck, detrimental to regional integration, as the GNR corridor would still be constrained in terms of capacity, quality, safety and resilience to climate change. Moreover, the need for the EU contribution is reinforced by the fact that finance is severely constrained in Zambia, as reflected by the ongoing negotiations with the International Monetary Fund (IMF) on a programme to restore macroeconomic stability.

The execution of works and delivery of supplies included in the project is scheduled to be implemented over a period of 48 months, followed by an approximately 24 months guarantee period. To summarize, the project is expected to: (i) foster regional integration by expanding intra-Africa trade and strengthening growth; (ii) boost sustainable and inclusive development and growth; (iii) transform Zambia from a land-locked to a land-linked country; and (iv) reduce the time and cost of transport along this regional strategic corridor with faster and smoother traffic flows, more reliable travel times, and vehicle operating cost saving.

4. A structural model for employment impact assessment in Zambia

4.1. Employment impact assessments and economic modelling

The main challenge with assessing the employment impacts of an intervention (for example, an investment project or a policy) lies in the fact that the employment outcomes of a specific intervention are not directly observable. While the total change in employment over time is often observable, this can represent the combined outcome of many events and forces affecting the economy. Existing techniques for employment impact assessment belong to two categories: econometric methods and simulation methods.

Econometric methods rely on empirical techniques to estimate the relationship between the intervention and employment outcomes while trying to control for other causes that might also affect the employment outcome. While econometric methods can provide very meaningful results when they are applied correctly, they tend to suffer from two key difficulties. First, the validity of this class of methods depends on the availability of large volumes of data, and this is particularly difficult in the context of low-income developing economies. Second, employment as a macroeconomic variable is an outcome of interactions of countless causal mechanisms in the economy, hence in principle it is impossible to control all the forces that might have effects on employment over a period of time in order to extract the causal relation between the intervention and the employment outcome. The result, therefore, will always be a correlation at best, which is of limited value for the purpose of assessing the employment impacts of a particular project.

Simulation methods involve constructing a macroeconomic model for the economy with well-specified causal and adjustment mechanisms. The model is calibrated using actual data and/or assumptions, and the intervention is modelled as a shock, which is applied to the model to simulate the employment and other macroeconomic effects. Compared to econometric methods, this class of methods often (although not always) enjoys the advantage of being less data-demanding, and its flexibility enables the modeller to take into account various features of the economy when building the model. However, the validity of this method depends crucially on how the economy is represented in mathematical form by the modeller, and an ill-constructed model based on an ill-represented economy will yield meaningless simulation results. Furthermore, given how complex this type of models often is, a lack of transparency is another common criticism.

The methodology for the present assessment belongs mostly to the category of simulation methods,[5] which involves building and calibrating a macroeconomic simulation model for Zambia. The model is based on the Structural Model for Sustainable Development (SMSD), which is a modelling framework developed by the ILO. The SMSD is adapted to building models for developing economies, and emphasizes socioeconomic structure and sustainability. The socio-economic structure of an economy, to some extent, is reflected in the Social Account Matrix (SAM), which is the starting point of any model based on the SMSD. Based on the SAM, a model is built, calibrated and used to conduct simulation analysis.

4.2. The Social Account Matrix (SAM) for Zambia

A SAM records the monetary transactions among main "actors" in an economy over a period of time. Transactions are represented in a set of interlinked accounts that record incoming and outgoing resources of such actors. Hence, a SAM links together the macro-statistics of national accounts with the micro-statistics of the labour market, household income and consumption and other social statistics (European Commission 2003). The national account component of the SAM includes "goods and services" and "production" accounts that can be represented in matrix form by classifying economic activity by industries and products. It also includes the "sequence of institutional sector accounts" which reports the transaction flows between economic actors grouped into five institutional sectors: (i) non-financial corporations; (ii) financial corporations; (iii) general government; (iv) households; and (v) non-profit institutions serving households (NPISH). Therefore, the SAM provides a representation in matrix form of the interlinked "generation of income", "allocation of primary income", "secondary distribution of income" and "use of income" accounts as well as a set of "accumulation accounts" for each institutional sector. This sequence is then linked to the goods and services and the production accounts so that the flows of income can be traced from production to their use as current expenditures and accumulation of assets. Transactions between domestic institutions and the rest of the world (RoW) are included to obtain a perfectly closed and balanced system. Therefore, a

[5] Although there are components of the framework that rely on econometric techniques, often for the purpose of balancing the SAM and calibrating the model.

SAM is a snapshot of the socio-economic structure of an economy as it emerges by the transactions amongst various key economic actors.

A full representation of these sets of national accounts in matrix form is also called the National Accounting Matrix (NAM) (European Commission 2003). The NAM includes the supply and use of products and the sequence of the institutional sector accounts at different levels of aggregation. When imposed by data constraints or required by the analysis, the NAM can be aggregated by product, industry or institutional sector, or the sequence of the flow of income can be reduced to a minimal number of transactions. A SAM extends the information of a NAM using household and labour income monetary flows, and thus provides useful details for the analysis of employment compensation and income distribution. Furthermore, a SAM can also incorporate the System of Environmental-Economic Accounting (SEEA), which is an accounting system that records interactions between the economy and the environment, making the SAM environment-focused.

The ILO and the Zambia Statistical Agency jointly produced the first Zambian SAM based on the System of National Accounts 2008 and the identification of selected "green industries" based on the SEEA and the Environmental Goods and Services Sector (EGSS) accounting systems. The outcome of the three-year project is a SAM with 24 industries, a distinction between formal and informal activities, and a breakdown of compensation of employees according to occupation, status, and formal and informal employment. The SAM has been produced by first generating a complete set of institutional accounts and a NAM for financial and non-financial corporations, households, general government and NPISH. Labour force and living conditions monitoring surveys provided estimates on employment composition as well as income and consumption expenditure flows by household quintile.

To illustrate, an aggregated three-sector Zambian SAM is shown in Appendix III. The first three rows and columns indicate the accounts. For each account, the elements on the corresponding row are expenditures to other accounts, and the elements on the corresponding column are income flows from other accounts. The column and row sums are always equal following the double-entry bookkeeping rule that total income equals total expenditure. There are two features that are worth mentioning here. A characteristic feature of this SAM is the inclusion of a full matrix of gross fixed capital formation (shaded in yellow) which represent the use of capital goods by productive activities and the flow of products (source) to industries (destinations). For example, in this matrix, the number 3,634 means that the agricultural sector purchased ZMK 3,634 million worth of goods from the manufacturing sector as capital goods to build its own capacity. It will be shown later that this information is crucial for estimating the permanent employment impacts of an investment operation.

4.3. The model for Zambia

The model for Zambia is composed of a set of relationships imposed by the accounting structure of SAM, by additional behavioural relationships assumed, and by adjustment mechanisms (closure rules) of the entire model. Hence the model is rooted in the accounting identities expressed in the SAM (incomes equal to expenditures), representing the existing productive and distributive structure of the economy. Following is a brief description of the key elements and adjustment mechanisms for the model; the actual equations are available upon request.

The model has four types of sectors:

1. The **agricultural sectors** are assumed to be constrained by the availability of capital and fertile land; hence they have fixed domestic supply. As demand changes, prices adjust to clear the market with flexible profit share.
2. As a commodity (copper) dependent economy, the **mining sector's** outputs are, to a large extent, dependent on exogenous given world demand, and price is fixed internationally. Changes in demand for mining products affect output and profitability.
3. **Utility and transport sectors** are constrained by fixed capacity; hence their domestic output is fixed. However, an investment operation would most likely build capacity in these sectors, which ultimately pushes the economy to a higher steady state generating long-term or permanent employment.[6]
4. **Other sectors'** (including manufactures, construction, and other services) domestic products are free to adjust to demand, in other words they are "demand-driven". The assumption is that firms in these sectors operate with excess capacity due to the existence of a large pool of un- and underemployed, and firms would mark their price up over the cost of production. Since labour and intermediate inputs are part of the cost of production, any changes in wage or price of other products would affect the price in these sectors via cost-push.

Thus, **output** and **prices** are determined following the aforementioned characteristics of the sectors. Due to the persisting high levels of unemployment and underemployment in Zambia, labour supply is assumed to

[6] To be defined in section 5.

be unlimited at an exogenously determined wage rate. Further assuming fixed productivity, **employment** and **income** are generated by additional levels of domestic industrial activity, which depends on the demand for domestic products and the product mix of each industry. **Demand** in this model depends on prices and the distribution of income. Tax rates are assumed to be fixed, so **government budget** balance adjusts in response to an intervention. **Current account** adjusts freely assuming a fixed nominal exchange rate, whereas real exchange rate still adjusts with price. In response to an intervention, the **saving-investment** balance is restored with incomes adjusting to generate the right amount of savings to meet investment.

Finally, the model allows the investment operation to build additional capacity for sectors with fixed short-run output, which in turn increases the output level (relaxing the output constraint) in the subsequent period. Less transport output constraint, for example, would stimulate additional activity in the generation of income and employment in the long run.

4.4. Setting the parameters of the model

Many parameters of the model are obtained using all the information from the SAM. Some parameter values, such as the nominal exchange rate, foreign price and basic price are normalized to one, which is equivalent to rescaling the quantity to a conforming unit of measure. Some other prices, such as the unitary price of activities and purchaser's price are obtained consistently with their definition and the SAM data. Employment-related parameters with detailed household-level breakdowns are mostly obtained from the Living Condition Monitoring Surveys (LCMS) and the Labour Force Surveys (LFS).

The estimation of the elasticity of substitution between domestic and foreign products (the Armington elasticity) is normally challenging especially for developing economies such as Zambia. The Armington elasticities used in computable general equilibrium (CGE) models are often substantially higher than those found in empirical studies, in order to generate the level of trade that is high enough to match reality (Gallaway, McDaniel, and Rivera 2003). For example, the Global Trade Analysis project (GTAP) sets it at around 3.1 on average, which is substantially above the empirical average (around 1.4). Studies have also found that the Armington elasticity is correlated with the level of development of the country, such as per capita GDP and degree of urbanization (Mijnen 2013). Since Zambia is a small developing economy, we use an elasticity equal to 3 for type 4 products. The export price elasticity in this model is set to be 0.75, as in Raza, Taylor, and von Arnim's (2016) model for sub-Saharan African countries, which is within the range of values set in other models for Zambia (Clausen and Schurenberg-Frosch 2012; Nhlane 2016).

The Linear Expenditure System (LES) is calibrated following (Taylor 1979), which involves first obtaining the Frisch parameter and Engle's elasticity, and then they are used to calibrate the floor consumption levels and the supernumerary income shares. The Frisch parameters for the 10 households are assumed to range between -1.6 (for the poorest rural households) and -2.5 (for the richest urban households). The actual Frisch parameter is difficult to estimate empirically, but Jean-Pascal (2005) estimated the Frisch parameter for Lesotho, a resource-dependent African economy with similar per capita GDP to Zambia, and found the Frisch parameter to be -1.6 and -2.2 for average rural and urban households, respectively; thus, the assumed values for Zambia are in general in line with those findings. The by-sector by-household Engel's elasticities are estimated econometrically using Zambia's LFS and LCMS, and the results are available upon request. The rest of the exogenous variables and parameters are calibrated directly from the SAM.

Temporary and permanent employment effects of the GNRU project

5.1. The intervention, and temporary versus permanent impacts

According to the GNRU project document, the intervention is an €434.95 million investment operation to build additional road transport capacity for Zambia, and the project cost is distributed between two sectors in the SAM: the construction and the professional services. The cost is first converted to the same base year as the SAM using both GDP deflator and exchange rate, and then it enters into the model as a shock – additional purchase of capital goods from construction and professional services sectors to build additional capacity for the transport sector. The project cycle lasts six years according to the original document. Hence, in the dynamic simulation, the project cost will be injected in the economy over a time horizon of six years.

The intervention generates two kinds of employment impacts: temporary and permanent. In this framework, a temporary employment impact is defined as employment generated by activities directly associated with the project itself (such as the construction of the road). The employment generated here is "temporary" because once the investment operation ends, holding everything else constant, the specific jobs will be lost. The model assesses the effect on employment demand generated by the project and not on the actual employment of individuals, and the attribute of being "temporary" or "permanent" refers only to such effects and not to jobs.[7] Effects are called temporary only from the perspective of the project, meaning that it is employment generated temporarily by the project alone. Permanent employment in this framework is employment generated by longer-lasting outcomes of the project. For example, for the GNRU project, the outcomes of the project are an improved transportation system and higher transportation capacity, which ends up stimulating the economy with cheaper transportation cost (both in terms of time and money) and better connectedness amongst various regions, as mentioned in section 3. In economic terminology, this pushes the economy to a higher output and employment levels.[8]

5.2. Temporary employment effects and macroeconomic impacts

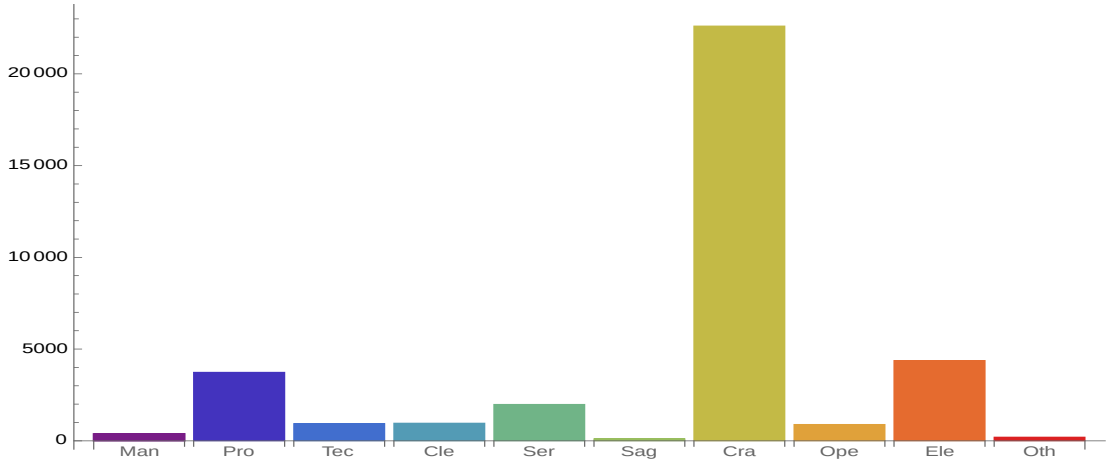
The injection of €434.95 million into the Zambian economy generates a sizable temporary employment impact of 36,222, and the impact is driven by a sudden increase in demand for products such as capital goods to invest in the transport sector (building the road). Such demand increase would stimulate economic activities and generate an additional employment effect. Since this is a full-fledged economy-wide disaggregated model, the employment impact is generated jointly by all the adjustment mechanisms embedded in the model, which includes the indirect (via intermediate consumption) effects, household consumption effects, price and substitution effects, and trade effects, among others. Among the estimated 36,222 temporary jobs,[9] 27,585 are in the construction sector, which is not surprising for a project like the GNRU. With respect to occupational breakdowns, figure 1 illustrates the employment generated, by occupation.

[7] Indeed, the workers employed in the project may very well benefit from the skills acquired during the project and increase their employability.

[8] These effects are assessed using a *ceteris paribus* approach which implies that unaccounted shocks other than those assessed can prevent those effects from truly persisting over time.

[9] Here "jobs" are the headcount of number of employees following the standard in ILOSTAT as well as the LFS.

▶ Figure 1. Employment generation by occupation

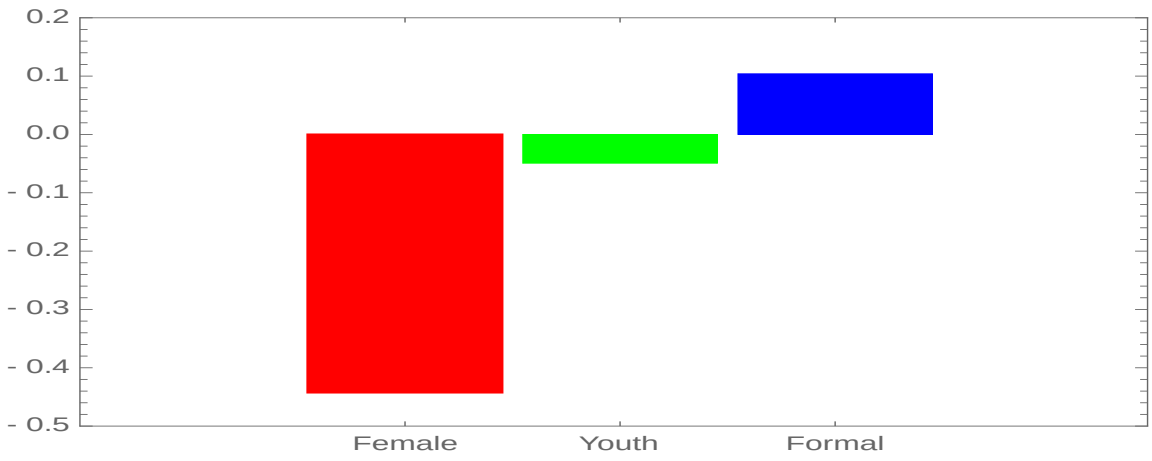


Source: Authors'calculation.

It is evident that the investment operation generates employment across all categories, but the craft and related trades (Cra) occupation category has the highest number of jobs. Jobs in the construction sector tend to belong to this occupation category.

In addition to occupations, the assessment finds that, amongst the total employment generated as temporary effects, 12.6 per cent are likely to be female, 13.1 per cent are young workers (between 15 and 25 years old), and 27.4 per cent are formal jobs. To acquire an overall understanding of how these numbers differ from the national average, figure 2 illustrates the degree of bias by age, sex and informality in the jobs generated.

▶ Figure 2. Biases, by age, sex and formal employment



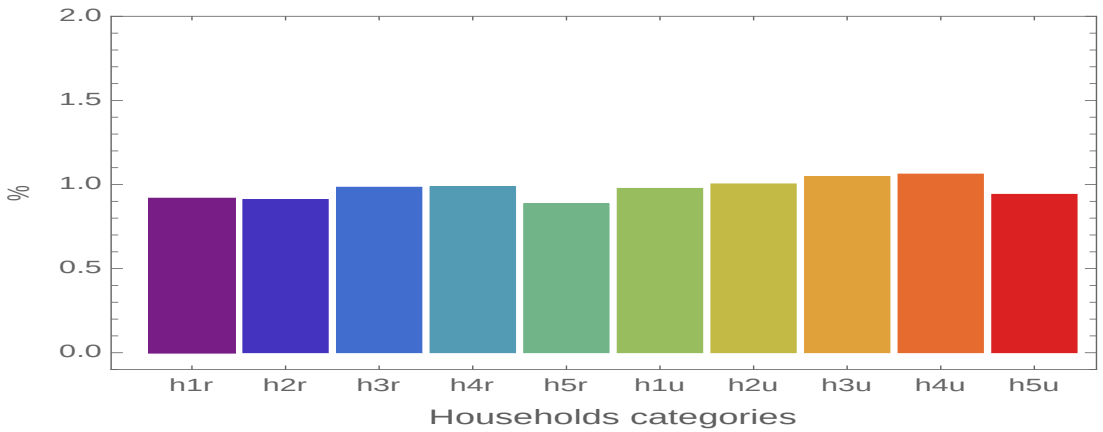
Source: Authors' calculation.

The three bars in figure 2 indicate the difference (in percentage points) between the percentages of female, youth and formal employment generated temporarily by the GNRU project, and the national averages. For example, the "Female" bar indicates that the percentage of female employment impact generated by the GNRU project is about 44 percentage points below the national average, indicating a significant gender employment bias against women. Essentially, figure 2 describes the kind of employment that is generated relative to the national average; that is, the GNRU project tends to generate more male, non-youth, and formal employment relative to the national average.

Finally, given that the model produces a full panel of macroeconomic results, the temporary effects of the GNRU on real household income and other macroeconomic variables can be examined. Figure 3 illustrates

the effects (measured by percentage change) of the GNRU project on real income growth by various household categories (rural: r, urban: u, by income quintiles).

▶ **Figure 3. Temporary effects of the GRNU on household real income growth**



Source: Authors' calculation.

It is evident from figure 3 that the work involved in the GNRU project would generate real income growth of about 0-95 per cent across all household categories of Finally, table 1 indicates the effects on the key macroeconomic variables.

▶ **Table 1. Macroeconomic outcomes**

Indicator	% Change
Real GDP	0.84
Inflation	0.40
Employment	1.68
Government balance	0.79
Trade balance	-0.44
Household (private) balance	0.98

Source: Authors' calculation.

The GNRU project would thus generate real GDP and employment growth accompanied by inflation. The employment effect is relatively large due to the high labour intensity in Zambia's construction sector. There is a slight improvement in real government and private balances, and a slight worsening of the trade balance due to the domestic price inflation.

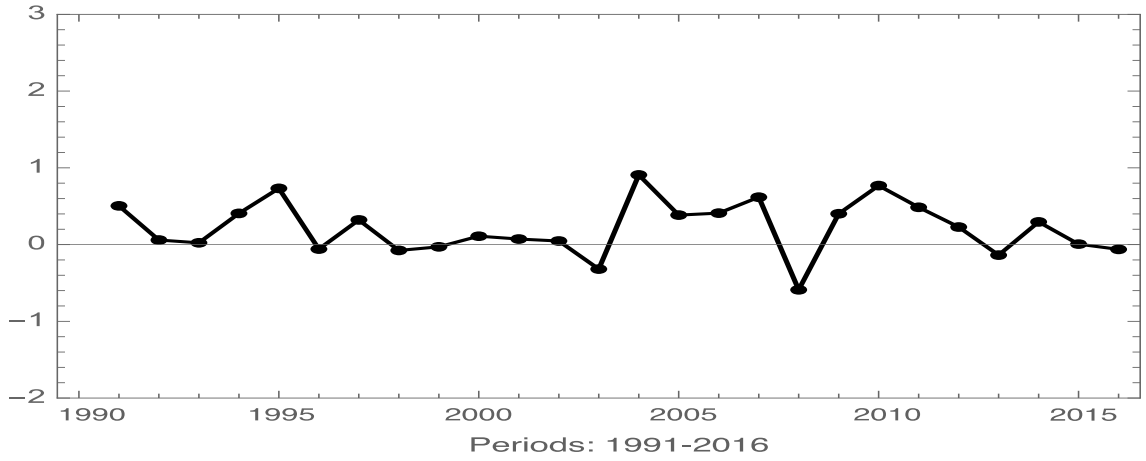
5.3. Permanent employment impacts

A permanent effect might start materializing when a project is almost or fully completed, depending on the nature of it. In the context of the GNRU project, the permanent effect comes in when the road is built to the extent that can be put in use, which in turn generates additional capacity for the transport sector, whose output is constrained in the short term. Since the present report is an ex-ante assessment, it is assumed that the permanent effect appears during the final project period, implying that the road is already useable before the completion of its construction. However, this assumption can be changed or updated with additional project-level information.

Quantitatively estimating the permanent effect is a challenging task and especially linking empirically the investment to the increase in capacity (or the "capacity effect"). Here, the well-established concept of Incremental Capital Output Ratio (ICOR) is used. "Incremental capital" indicates how much additional capital is accumulated between two periods, whereas "Incremental outputs" indicates how much additional output is produced. Hence, the ICOR measures how much additional capital is required to produce an additional unit of output. And the inverse-ICOR, which is calculated below, measures how much additional output capacity can be obtained with an additional unit of investment in the relevant sector. While change in output by sector can be measured relatively easily, measuring increment of capital stock can be difficult. The increment of the capital stock in a sector, which is the change of a "stock" variable, can be approximated by the investment in that sector, which is a "flow" variable. This investment is called "investment by destination". Most national accounts and input-output tables provide "investment by sources", that is, the total demand for each sector's outputs as capital goods, instead of "investment by destination", which is how much investment (capital accumulation) each sector is receiving. However, a distinguishing feature of the present SAM allows the distinction between investment by source and destination. The segment of the SAM consisted with the Products rows and the Gross Fixed Capital Formation (GFCF) columns (highlighted in yellow in the SAM in Appendix III) shows the relationship between the demand of investment goods by source on the rows and by destination on the columns. Hence, assuming a stable relationship between source and destination, the "capital coefficient matrix" can be constructed using the structure of the aforementioned segment of the SAM, such matrix is then used to transform a vector of investment by source into vectors of investment by destination. The *inverse*-ICOR by sector for Zambia is calculated as follows:

1. Time series by sector output and investment by source are downloaded from the Eora Global Supply Chain database, Zambia National Input-Output Tables.
2. These data are converted into constant prices values using the GDP deflator.
3. Eora's investment by source is calculated on an industry-by-industry basis. This is transformed into product-by-industry data using the Supply Table from the Zambian SAM, so it is consistent with the data as well as the model (products are demanded instead of industry-level outputs).
4. The investment by source by product data is then transformed into investment by destination by industry using the capital coefficient matrix.
5. A time series of *inverse*-ICOR is constructed using the ratio between the investment by destination data as well as annual changes in real output. Figure 4 shows the *inverse*-ICOR for Zambia between 1991 and 2016.

▶ Figure 4. Zambia's inverse-incremental output capital ratio

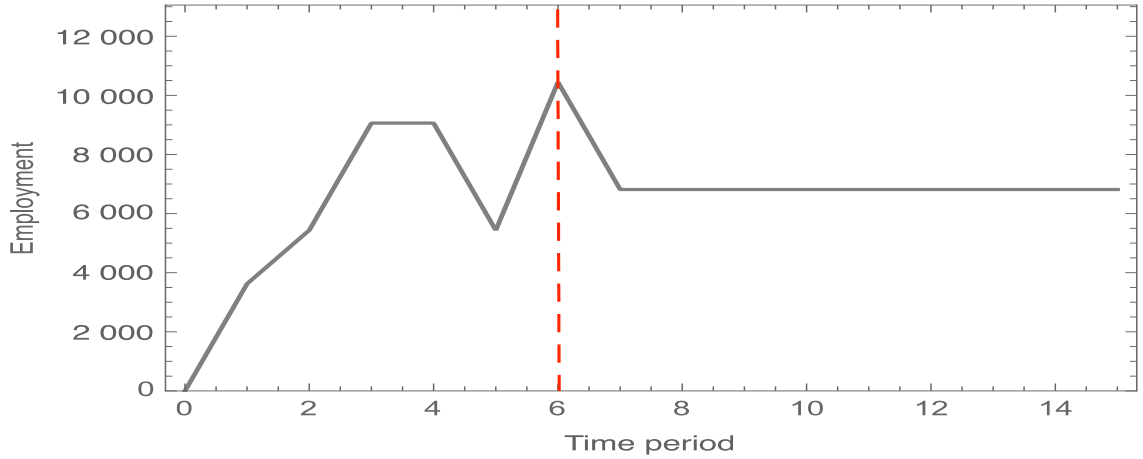


Source: Authors' calculation.

According to figure 4, the *inverse*-ICOR for Zambia seems to be relatively stable. For this report, the inverse-ICOR takes on the average value of 0.3117,[10] which means that for an additional unit of capital accumulated in the country's transport sector, the output increases by 0.3117 units.

The simulation is conducted for the 15-year period with the first six periods as the construction phase where total cost of the project is expended by the sequence of 10 per cent, 15 per cent, 25 per cent, 25 per cent, 15 per cent, 10 per cent. The sequence intends to mimic the so-called S-curve[11] - a chart showing construction cash flows over a "standard" project's life. After the construction completes at the 6th period, the short-term effects end, but the capacity effect comes in at the 5th period with the transport sector's output expanded according to the ICOR. This follows the assumption that the road becomes usable starting with the final year of construction. Employment effects generated due to transport capacity expansion are considered as "permanent" for the reasons explained in section 5.1. The simulation is shown in figure 5.

▶ **Figure 5. Total employment impacts, temporary and permanent**



Source: Authors' calculation.

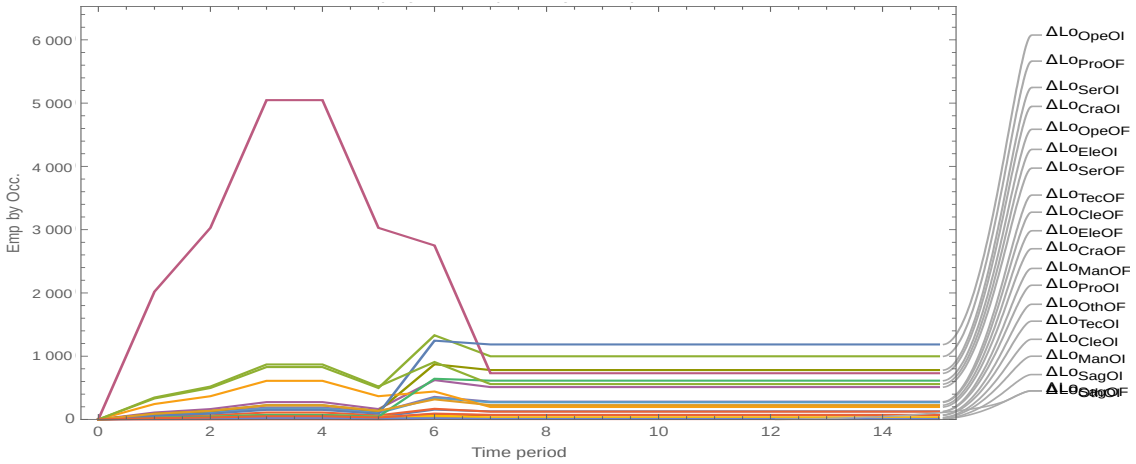
Figure 5 illustrates how employment is generated over time. For the first six periods, the project would generate employment due to the injection of the project fund of €434.95 million into the economy, which corresponds to the estimated total effect of 36,222 temporary jobs. Notice that from period 1 to 5 the size of the temporary employment impact rises and falls following the aforementioned sequence of the injection of the project fund; however, at period 6, the size of employment generation jumps to 10,445. This is a combination of temporary employment (3,632) as the result of the last 10 per cent of project fund injected into the economy, plus the permanent employment effect (6,813) of the capacity expansion that comes in at period 6.[12] At period 7, without the capacity expansion, the employment generation would fall to zero because the project itself ends there; however, thanks to the additional transport capacity built by the GNRU project, the economy reaches a higher level of output and employment. The employment effect of 6,813 is "permanent" in the sense that it will remain there after the project ends.

[10] More sophisticated econometric techniques might be used to yield better estimates than the ICOR, but are beyond the scope of the current report.

[11] For an illustration and explanation of the S-curve, see here.

[12] While it is more likely that the permanent effect will take time to realize, given this is an ex-ante assessment, for now it is assumed that the permanent effect is fully realized at period 6.

▶ Figure 6. Shows the employment impacts by occupation over time

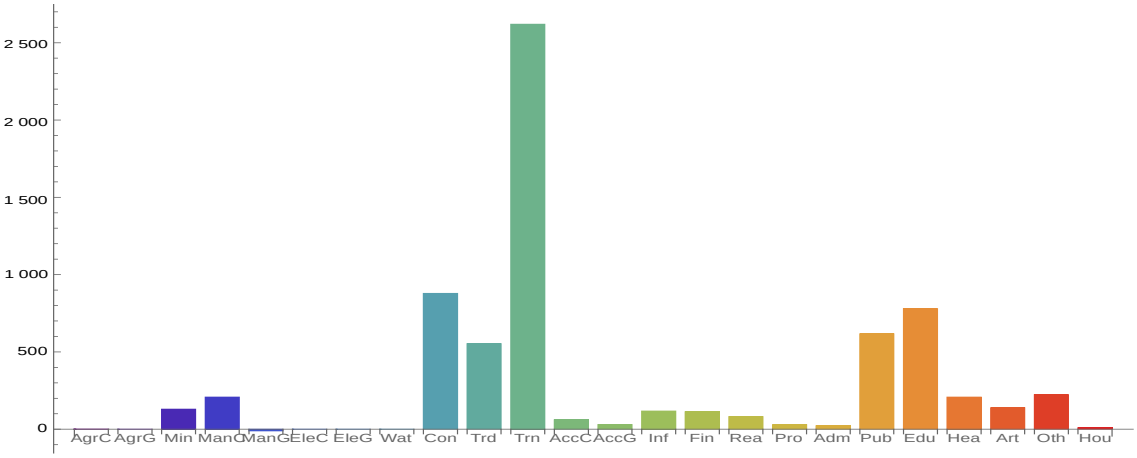


Source: Authors' calculation.

It is evident from figure 6 that during the construction phase, the project is estimated to generate a large employment effect for "informal crafts and related trade workers" as indicated by the purple line; these are mostly construction workers without surprises. However, after the project is completed, labour demand will change with the transition from the temporary to the permanent effects: the capacity effect comes in at period 6, which is also the last period of the construction phase, and starting period 7 there is only capacity effect. The capacity effect generates employment with a different occupational profile where most employment generated belongs to the "informal plant and machine operators, and assemblers" category, followed by "formal professionals" and "informal service and sales workers" categories.

Moreover, a closer look at the permanent employment created by the project shows that while expected employment is mostly generated in the transport sector, there are also widespread employment effects in other sectors, most notably in the construction, education, and public administration sectors. The permanent employment effects by sector are shown in figure 7.

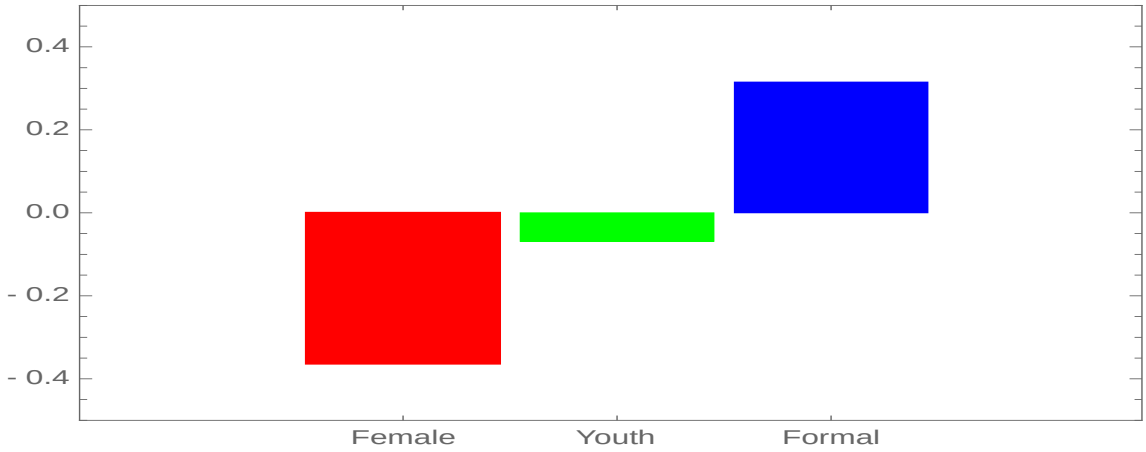
▶ Figure 7. Permanent employment generation, by sector



Source: Authors' calculation.

Bias in age, sex and formality are shown in figure 8.

▶ Figure 8. Permanent employment bias, by age, sex and formality

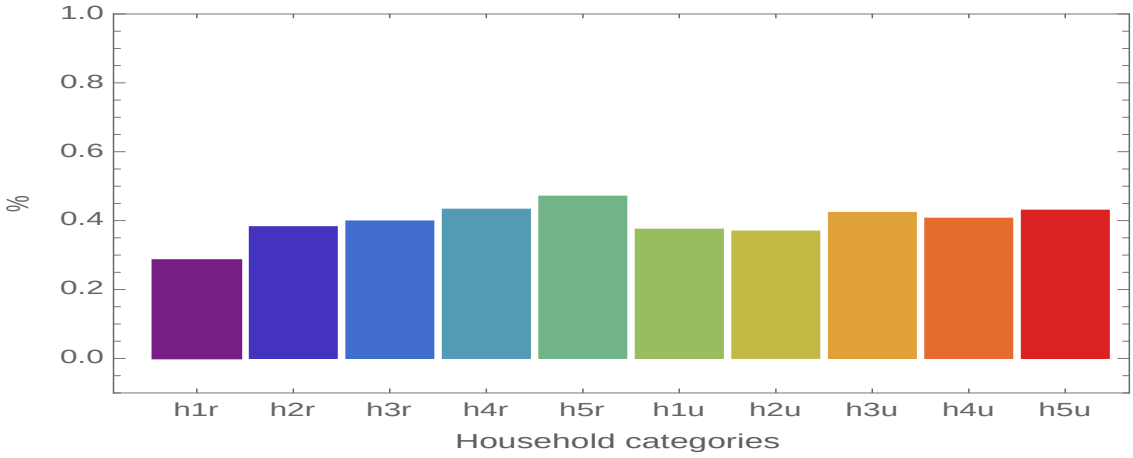


Source: Authors' calculation.

It is evident from figure 8 that the pattern of bias by age, sex and informal employment here is similar to that of the temporary employment effects, which means that permanent employment effects generated by this project tends to favour more male, non-youth and formal employment, relative to national averages. However, there is a considerable amount of difference in the extent of it. The gender bias is smaller for the employment created with permanent effects as compared to temporary effects (0.34 vs 0.44), and formal employment is considerably higher (0.31 vs 0.10). The difference is explained by the different compositions of sectors impacted by temporary and permanent effects, with the latter being more female- and formal-intensive compared to the former.

Finally, in terms of other macroeconomic effects, the capacity effect is estimated to create a slight downward pressure on the price level since the expansion of transport capacity would reduce the cost of transports, thus the reduction in the cost of all products (cost-pull deflation). The transport capacity expansion and cost reduction would stimulate economy-wide production with real GDP growing by 0.37 per cent. The real household income growth is shown in figure 9.

▶ Figure 9. Permanent effects of the GNRU on household real income growth



Source: Authors' calculation.

Overall, the capacity effect increases household real income by around 0.4 per cent. It is interesting that richer households tend to benefit slightly more from such effect in terms of real income. This is the outcome of complex interactions between various macroeconomic forces.[13]

[13] We omit here the presentation of the effect on all other macroeconomic accounts, given their negligible size.

5. Concluding remarks

The European Union is supporting Zambia's Great North Road Upgrading (GNRU) project via its External Investment Plan (EIP). The project aims at fostering regional integration by expanding intra-Africa trade, strengthening growth and reducing the time and cost of transport along the corridor. This ex-ante assessment of the employment impact of the GNRU project has been carried out by conducting a simulation exercise using a SAM-based macroeconomic model constructed using the Structural Model for Sustainable Development (SMSD) framework. The assessment finds that the GNRU project is expected to generate a sizable employment impact of 36,222 jobs due to temporary effects, the majority of them coming from the construction sector and many of them belonging to the craft and related trades occupation category. The temporary employment effects generated tend to have a large gender bias against women, a slight age bias against young workers and a clear bias favouring formal employment. The GNRU project is also estimated to generate 6,813 jobs due to permanent effects, most of them belonging to the "informal plant and machine operators, and assemblers" occupational category, followed by "formal professionals" and "informal service and sales workers". While the permanent effects still exhibit bias against women and youth, and favour formal employment, the extent of gender bias is considerably less, and the bias favouring formal employment is significantly larger.

The GNRU project is estimated to have considerable positive employment impacts. However, the gender bias in temporary and permanent employment effects is most concerning, although not extremely surprising given that most of the jobs generated will be in construction and transport, which traditionally are more male-intensive. Gender bias can be addressed by making the hiring process more female-friendly and the workplace more gender-sensitive, which will ultimately steer the gender composition of the employment impacts towards more female employment.[14]

Although not nearly as severe as the gender bias, the assessment also finds slight bias against youth in both temporary and permanent employment impacts. If the project aims at absorbing more youth labour supply in Zambia, then efforts are needed to bring more young workers into the labour market, which includes providing the training and education needed to meet the labour demand. Additionally, youth-friendly hiring policies can be implemented when circumstances allow. Furthermore, the model assumes that labour is abundant for all sectors and occupations, so that as long as there is a labour demand there will be labour supply. Hence, the employment outcomes are, to a large extent, labour demand outcomes. In reality, for some sectors and occupations, some labour demand will not be met by labour supply due to skill constraints. Skill gap analysis can be conducted to complement the present analysis, and skill-building strategies can be implemented once skill constraints have been identified. The ILO has the capacity and experience in providing technical assistance in these areas for its constituents.[15]

Sectoral and economy-wide modelling are often used to conduct employment impact assessment. The SMSD framework enables modelling based on the data as well as structural features of the economy under investigation. This framework is particularly suitable for a low-income developing country like Zambia, with robust structural features such as commodity dependence, sector constraints, uneven distribution of income and the existence of high un- and underemployment. Furthermore, the Zambian SAM jointly constructed by the ILO and ZamStats contains a unique module that distinguishes investment source and destination, which allows for estimating the permanent impacts. One possible limitation of the current analysis is that the reference SAM (which is the latest available) dates to 2010. While the model generates results based on the structure and not the actual levels represented in the SAM, estimates could be improved by using a new SAM based on a new benchmark supply and use table. Second, the model assumes constant productivity, which might cause upward bias in estimating employment outcomes, assuming there is constant productivity growth. Empirical works estimating and forecasting the evolution of labour productivity for Zambia would overcome this limitation. Third, at this stage, it is assumed that labour supply is abundant with a fixed nominal

[14] The ILO has a wealth of experience in providing technical assistance in this area. See: Employment Policy Brief: Building a gender-equitable future through Employment Intensive Investment Programmes (ilo.org) (ILO 2019); and https://www.ilo.org/global/topics/employment-intensive-investment/publications/WCMS_459976/lang--en/index.htm (ILO 2016) for examples.

[15] For example, the Employment Intensive Investment Program aims at leveraging infrastructure development for decent job creation and poverty reduction. See: Employment intensive investments (Employment intensive investment) (ilo.org)

wage. While labour abundance and sluggish wage growth are important structural features in the Zambian economy, this does not need to be the universal case for all labour categories. It can easily be imagined that some sectors might face severe labour shortages for skilled workers. Differentiated adjustment mechanisms based on sector and occupational categories can be built into the model to improve the results. Fourth, the sectors in the model are too aggregated to accurately capture the nuances in the sector where the project is actually working. In fact, this is a common criticism for any SAM or IOT-based analysis because sectors in SAM and IOT are often very aggregated. Disaggregating the sectors in a SAM or IOT can be extremely costly, hence one has to be careful with interpreting the results, and perhaps complement the assessment with more sector-specific analysis. However, the present model already generates extremely useful insights on the potential employment and macroeconomic impacts of the GNRU project. Furthermore, the ability to methodically assess the permanent employment and macroeconomic impacts of the investment operation is another achievement of the current analysis.

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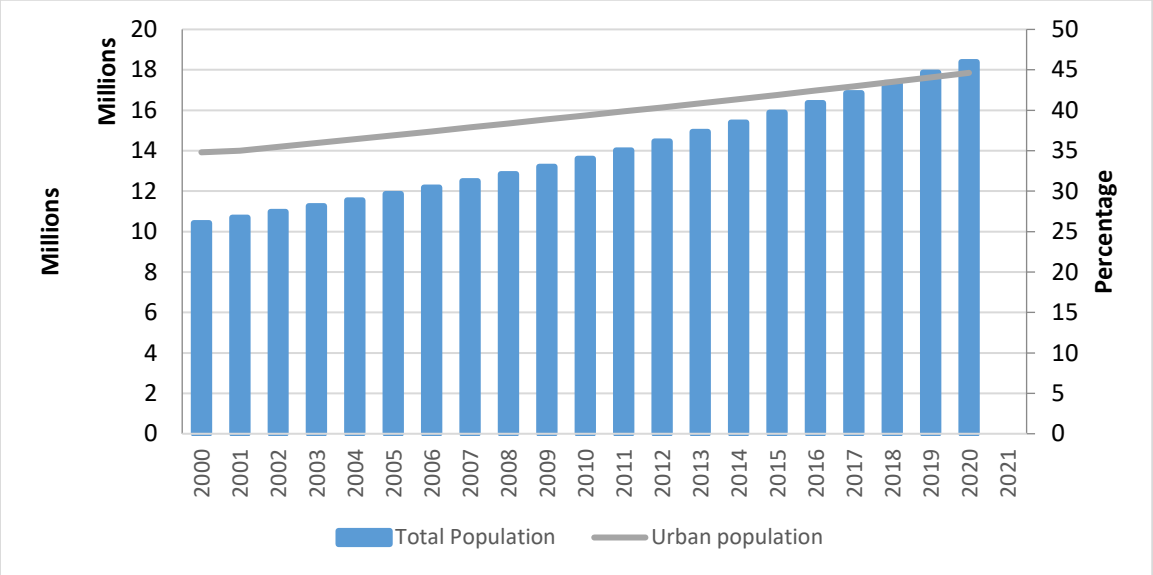
Annex 1

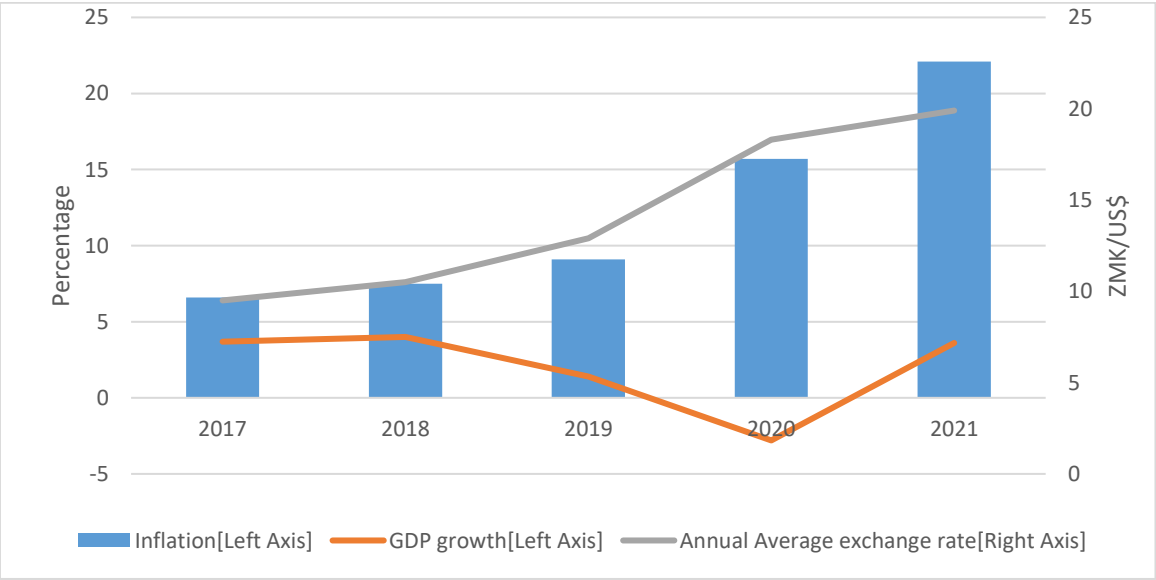
Figures

▶ Figure A1. Population trend in Zambia, 2000–21



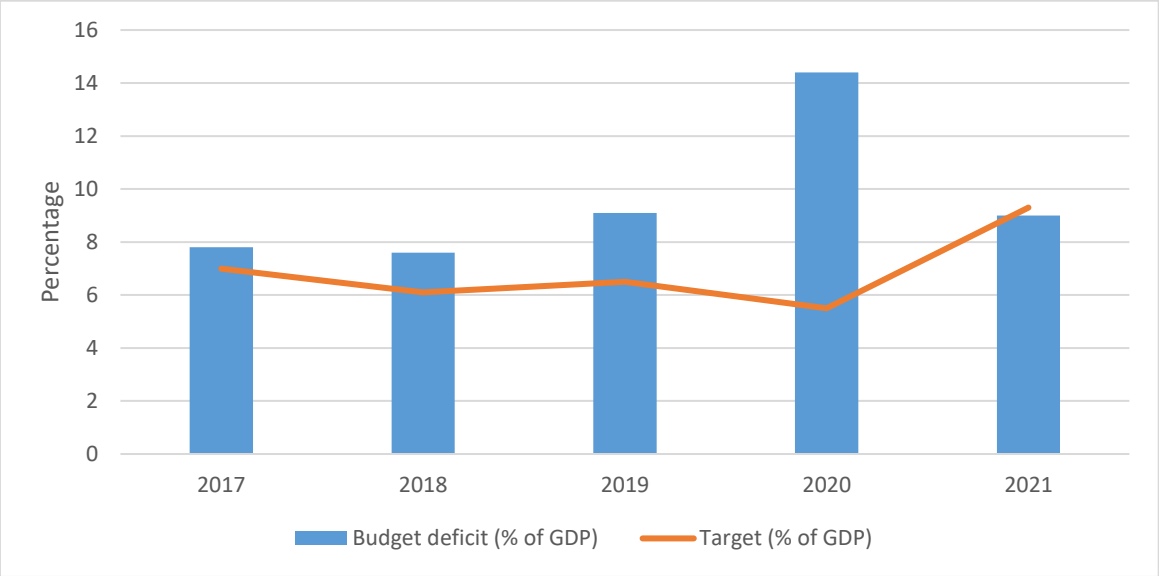
Source: Authors' construction using ZamStats data.

▶ Figure A2. Inflation, GDP growth and exchange rate, 2017-21



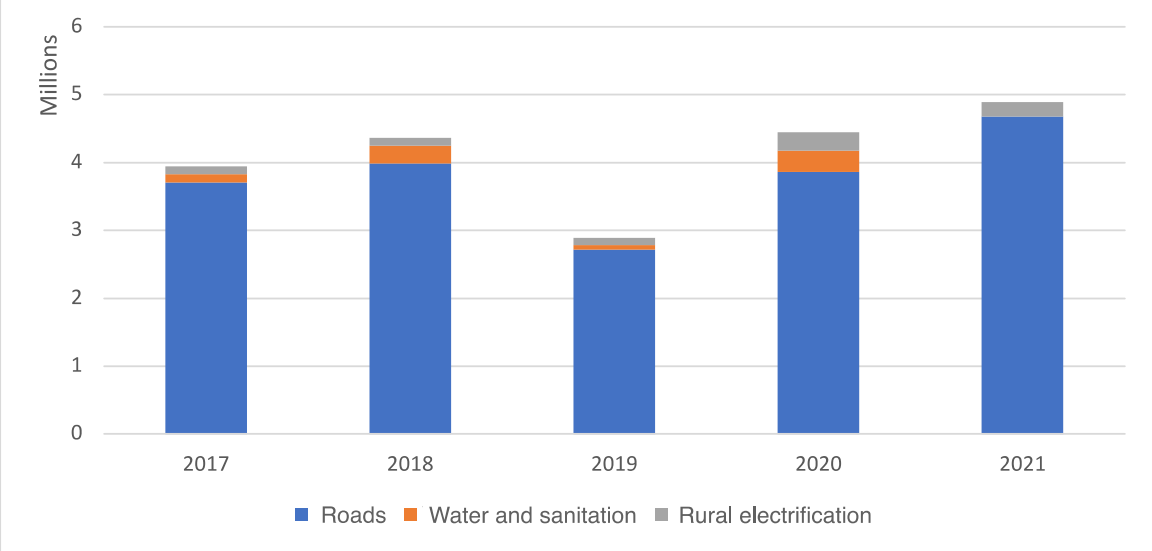
Source: Authors' construction using Ministry of Finance and National Planning data.

▶ **Figure A3. Fiscal deficit, 2017- 21**



Source: Authors' construction using MoFNP data.

▶ **Figure A4. Expenditure outlay on roads, water and sanitation, and rural electrification, 2017-21**



Source: Authors' construction using MoFNP fiscal tables.

Annex 2

Tables

▶ Table A1. GDP by industry at constant 2010 prices, 2017-21 (ZMK millions)

Industry	2017	2018	2019	2020	2021
Primary sector	**24 471.14**	**23 144.74**	**23 019.08**	**25 670.74**	**24 641.40**
Agriculture, forestry and fishing	10 419.00	8 212.50	8 845.10	10 367.10	10 298.60
Mining and quarrying	14 052.10	14 932.20	14 174.00	15 303.70	14 342.80
Secondary sector	**28 176.90**	**29 255.70**	**28 569.80**	**27 983.10**	**30 260.80**
Manufacturing	10 837.10	11 278.30	11 552.00	11 665.30	12 151.40
Electricity, gas, steam and air conditioning supply	2 199.70	2 458.00	2 258.10	2 328.50	2 623.60
Water supply	327.7	344.5	340.2	347.4	356.3
Construction	14 812.30	15 174.90	14 419.50	13 641.90	15 129.60
Tertiary sector	**74 003.20**	**79 377.50**	**82 172.40**	**77 157.60**	**80 674.20**
Wholesale and retail trade	28 806.40	29 760.00	29 872.80	26 123.30	26 713.10
Transportation and storage	4 620.60	4 977.40	4 839.60	5 508.10	5 898.60
Accommodation and food service activities	2 539.70	2 582.30	2 639.70	2 047.50	2 195.10
Information and communication	4 408.60	6 176.10	7 327.90	8 373.30	10 018.80
Financial and insurance activities	4 467.20	5 517.20	5 963.10	6 740.60	7 183.50
Real estate activities	4 558.60	4 707.30	4 869.80	5 042.40	5 225.70
Professional, scientific and technical activities	2 480.70	2 542.40	2 520.30	2 691.50	2 705.20
Administrative and support service activities	1 260.10	1 337.10	1 340.60	1 384.80	1 435.70
Public administration and defense	6 972.50	7 082.10	7 671.40	6 454.70	6 410.60
Education	10 371.90	10 866.00	11 057.00	8 921.30	8 870.40
Human health and social work activities	1 989.50	2 208.10	2 390.60	2 567.50	2 631.60

Arts, entertainment and recreation	498.9	559.5	580.8	165.1	206.6
Other service activities	1 028.60	1 062.10	1 098.80	1 137.70	1 179.10
Total gross value added for the economy	126 651.30	131 778.00	133 761.30	130 811.50	135 576.40
Taxes less subsidies	**7 619.30**	**7 910.20**	**7 940.20**	**6 943.50**	**7 100.30**
Total for the economy, at market prices	**134 270.60**	**139 688.20**	**141 701.50**	**137 755.00**	**142 676.80**

Source: Authors' construction using 2021 Annual Economic Report.

▶ Table A2. SADC Infrastructure Quality Competitiveness Scores, 2019

	Transportation infrastructure quality	Road connectivity	Quality of roads	Rail density	Efficiency of train services	Airport connectivity	Efficiency of air Transport services
Angola	36.2	77.7	19.2	…	…	26.9	38.1
Botswana	41.3	93.3	46.5	3.9	43.5	15.8	45
Congo, Democratic Rep.	21.5	59.3	18.4	4	15.3	16.9	30.7
Eswatini	41.1	64.5	50.4	43.6	35.3	5.9	47.2
Lesotho	21.4	44.7	29.2	…	…	5.8	6
Madagascar	24.7	49	17.4	2.9	17.4	20.3	41.4
Malawi	33.2	78.4	30.1	20.3	18.5	12.8	39
Mauritius	49.1	36.3	61.4			37.8	66.5
Mozambique	28.6	68	23.4	9.9	27.2	18.9	33.4
Namibia	48.3	98.1	71.8	8	40.3	24.1	64.1
Seychelles	42.2	…	50.4	…	…	30.7	57.3
South Africa	58.7	96.2	59.1	43.2	34.1	63.5	74.5
Zambia	36.6	77.5	40.6	7.2	17.7	25	51.5
Zimbabwe	35.7	85.9	30.6	17.8	15.2	22.5	42.1

Source: Authosr' construction based on 2019 Global Competitiveness Index Scores.

Annex 3

Aggregated three-sector SAM for Zambia

		Products			Industries			Income Generation			Current Transactions												Capital Transactions			GFCF			Financial	RoW	Total
											Institution												Institution			Activities					
		Agri	Manu	Serv	Agri	Manu	Serv	Wage	Profit	Taxes	Firms	Gov.	h1r	h2r	h3r	h4r	h5r	h1u	h2u	h3u	h4u	h5u	Firms	Gov.	H.H	Agri	Manu	Serv			
Products	Agri	0	0	0	4015	11398	1230				0	0	176	426	754	1451	2879	47	145	224	377	1241	714	0	26	219	0	0		4488	29811
	Manu	0	0	0	6472	7214	16214				0	27	421	1017	1801	3466	6876	292	891	1381	2320	7643	755	0	507	3634	1869	4622		29906	97326
	Serv	4612	19139	-23751	9054	3230	16765				4106	9091	113	273	484	778	1535	512	887	1349	2221	7161	0	0	0	1418	395	12969		2483	74823
Industries	Agri	22911	17111	1445																											41467
	Manu	0	28212	1569																											29781
	Serv	0	5361	92316																											97677
Income Generation	Wage				10498	3264	41637																							97	55496
	Profit				11421	4676	21852																							0	37949
	Taxes				7	0	-21																							0	-14
Current Transactions	Firms	0	0	0				0	33799	0	1596	3464	1	16	36	91	226	3	14	47	72	1308								1318	41991
	Gov.	-301	4585	1096				0	460	-14	3300	0	4	83	195	474	1044	15	80	267	401	1625								772	14085
	h1r	0	0	0				254	222	0	229	7	0	0	0	0	0	0	0	0	0	0								5	718
	h2r	0	0	0				1291	238	0	264	12	0	0	0	0	0	0	0	0	0	0								19	1823
	h3r	0	0	0				2421	252	0	566	10	0	0	0	0	0	0	0	0	0	0								41	3290
	h4r	0	0	0				5102	228	0	1032	21	0	0	0	0	0	0	0	0	0	0								55	6438
	h5r	0	0	0				11244	167	0	1349	65	0	0	0	0	0	0	0	0	0	0								78	12904
	h1u	0	0	0				793	16	0	28	27	0	0	0	0	0	0	0	0	0	0								10	874
	h2u	0	0	0				2558	45	0	56	24	0	0	0	0	0	0	0	0	0	0								17	2699
	h3u	0	0	0				3928	160	0	149	93	0	0	0	0	0	0	0	0	0	0								19	4349
	h4u	0	0	0				6319	450	0	300	157	0	0	0	0	0	0	0	0	0	0								24	7249
	h5u	0	0	0				21447	1912	0	1506	300	0	0	0	0	0	0	0	0	0	0								102	25267
Capital Transactions	Firms										21051	0	0	0	0	0	0	0	0	0	0	0	29	699	0					0	21779
	Gov.										0	710	0	0	0	0	0	0	0	0	0	0	0	0	0					718	1428
	h1r										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0	0
	h2r										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0	0
	h3r										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0	0
	h4r										0	0	0	0	0	152	0	0	0	0	0	0	0	0	0					0	152
	h5r										0	0	0	0	0	0	309	0	0	0	0	0	0	0	0					0	309
	h1u										0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					0	0
	h2u										0	0	0	0	0	0	0	0	675	0	0	0	0	0	0					0	675
	h3u										0	0	0	0	0	0	0	0	0	1073	0	0	0	0	0					0	1073
	h4u										0	0	0	0	0	0	0	0	0	0	1848	0	0	0	0					0	1848
	h5u										0	0	0	0	0	0	0	0	0	0	0	6241	0	0	0					0	6241
GFCF	Agri																						5009	0	263						5272
	Manu																						2263	0	0						2263
	Serv																						7149	2423	8018						17591
Financial																							5860	-1694	1484					-5650	0
Row		2588	22919	2148				139	0	0	6459	76	2	9	19	27	34	5	8	9	10	48								-4932	29569
Total		29811	97326	74823	41467	29781	97677	55496	37949	-14	41992	14085	718	1823	3290	6438	12904	874	2699	4349	7249	25267	21779	1428	10299	5272	2263	17591	0	29569	

Note: Service sector includes construction.

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