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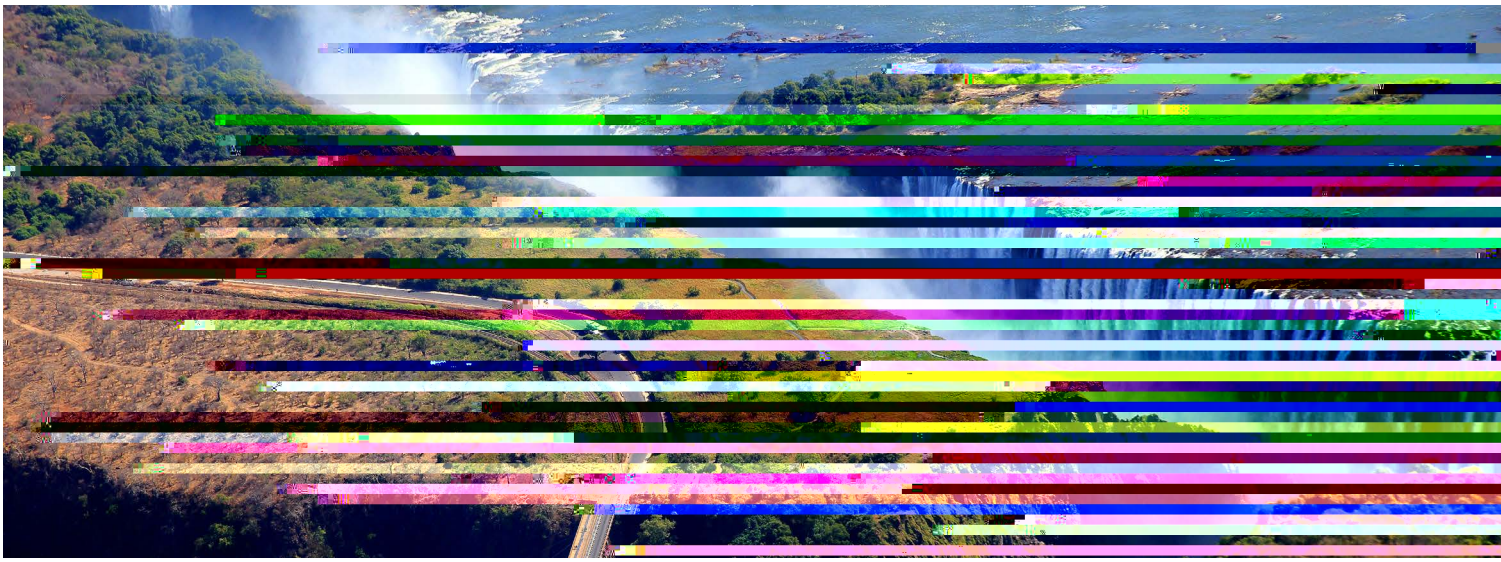

Greening the Recovery in Zambia

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Executive summary

The COVID-19 pandemic had widespread impacts across the world. These impacts have been severe for the health of populations and economies and have prompted calls to re-think the direction of economic and social development. Arguments for a more sustainable, green model of development have been strengthened by the increasing impacts of climate change and the global energy crisis.

This report sets out some results and recommendations from a two-year research project on

. The project was carried out by research teams at the University of Ghana in Ghana, University College London in the UK, and the Zambia Institute for Policy Analysis and Research in Zambia. The teams analysed stakeholder views on the options for a green recovery from the pandemic, co-developed future scenarios with these stakeholders, analysed the energy system implications using quantitative models, and developed recommendations for decision-makers. This report focuses on results and policy recommendations for Zambia.

Three potential pathways for greening the recovery in Zambia were co-developed with stakeholders, which were distinguished by their envisaged role for government. The first scenario, gravitates towards policy approaches that reflect the government's stated interest in an export-led trade strategy, and for investment in large-scale infrastructure which leverages investment in public-private partnerships. The second scenario, reflects efforts to drive decentralisation of various government functions and places a greater emphasis on local solutions for local challenges. The Scenario explores the potential for Centralised and Decentralised approaches to operate in tandem.

The energy system implications of these scenarios were modelled and revealed that, if other strategies such as energy efficiency and clean cooking strategies are implemented, then the scenario has the potential to meet energy demands at lower cost and emissions. Under , the consumption of fossil fuels, such as gas and coal, is expected to accelerate and drive growth in the transport and residential sectors. However, Zambia's potential for green transition will require the use of efficient and innovative technologies to limit resource depletion. Across all scenarios, significant investment is needed to provide access to clean energy and support energy sector development over the coming decades.

To support a green recovery in Zambia, the report makes four recommendations for decision-makers:

It is essential to coordinate across sectors in planning and preparedness to enhance resilience, and to take advantage of emerging opportunities. Climate or pandemic-related disruptions affect multiple economic sectors and social lives in complex and unpredictable ways. There is a need to rethink governance mechanisms to address these interlinked challenges.

There is a need to devolve decision-making and planning as

As a State party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Accord, Zambia submitted an updated Nationally Determined Contribution (NDC) in July 2021. In this rea f rmation, the country developed indicators on adaptation actions that will allow tracking its progress with respect to resilience in both the human and physical systems. The updated NDC outlines a broadened approach to mitigation in sustainable agriculture, renewable energy, transport, liquid waste and coal (production, transportation and consumption). The policy and legislative framework governing climate change-related aspects witnessed the development of the National Policy on Climate Change (NPCC) 2016. The NPCC provides the framework for coordinating climate change programmes to ensure climate resilient and low carbon economic pathways for sustainable development towards the attainment of Zambia's Vision 2030. The NPCC also promotes mainstreaming of climate change into policies, plans and strategies at all levels in order to account for climate change risks and opportunities in decision making and implementation (GRZ, 2016).

The Government of the Republic of Zambia (GRZ) has recognised climate change as a development challenge. In this regard, in 2021 the GRZ created the Ministry of Green Economy and Environment, which is fundamental to setting policy guidance with respect to climate change. This ministry is expected to facilitate climate actions not only at national level, but also sub-national levels (provincial, district and sub-district). It is also responsible for integration of climate change in

Research Objectives

The project was carried out by research teams in Ghana, Zambia and the UK. The interdisciplinary team included researchers with backgrounds in policy and governance analysis, energy system modellers and futures analysis. The project had four overarching objectives:

- To understand the drivers,

Economic measures were also instituted aimed at giving relief to the most impacted segments of the economy, such as small and medium-sized enterprises (SMEs). In this regard, the government released K2.5 billion (US$137.2 million) with the view of reducing arrears owed to various suppliers of goods and services in response to the immediate shocks of the pandemic. Further, the government, through the Cabinet O f ce, approved a COVID-19 Contingency and Response Plan with a budget of K659 million (US$36.2 million) under the Disaster Management and Mitigation Unit (DMMU) and went on to mobilize more resources from various local and international stakeholders. Additionally, the government ofered some tax measures – direct and indirect – including payment deferrals and rate reductions across sectors.

Similarly, the Bank of Zambia instituted several measures by cutting lending rates to access credit from the central bank. In addition, the government through the Central Bank announced a number of measures to encourage the use of digital fnancial services. For example, these measures include, among others:

1. Waived charges for person-to-person electronic money transfers of up to K150 (US$8.23). These transactions are now free of charge; and,
2. Revised upwards transactions and balance limits for individuals, small-scale farmers and enterprises. The limits by agents have since been revised upwards to give agents more foat to deal with transactions. This is made to decongest banks.

Furthermore, the government through the central bank established an economic stimulus package that was fnanced through the issuance of a COVID-19 bond. This was in addition to other economic measures instituted by the Government such as the availing of K2.5 billion (US$137.2 million) in fnancial relief for businesses, and the Bank of Zambia's K10 Billion (US$548.8 million) Medium-Term Refnancing Facility made available to eligible commercial banks and non-bank fnancial institutions to access in order to restructure, refnance or extend credit to businesses and households impacted by COVID-19 on more favourable terms while ensuring that fnancial institutions adhere to set objectives.

Overall, there are two observations to be made about the efect of the pandemic in Zambia as well as the government response that is relevant to this research project. First, the pandemic and its impact on livelihoods, health systems and infrastructure demonstrate the need to invest and build social and economic resilience. This means better short and long-term planning and preparedness to shocks and uncertainties. Furthermore, eforts must be made to ensure that during times of crisis, other long standing socioeconomic issues do not get overlooked. For instance, HIV/AI7 (r)-4(7 .i)-8.4 (-7

3. Scenarios for a greener recovery

Scenarios are tools which can help to improve decision making in respect of an uncertain future. Scenarios can also help inform strategic decisions, improve

Table 2. Snapshot of Decentralised scenario in 2063

Diverse, resilient and inclusive economy	Zambia's extractive sector spans a range of minerals and value-added manufacturing including batteries and electromobility manufacturing, supported by a National Research Institute.
Universal and equitable access to social services	Fiscal income from mineral extraction is directed to local authorities, via the Constituency Development Committee, supporting full coverage of health, water and sanitation, education services. Rural livelihoods are increasingly viable.
Universal access to sustainable energy	Proliferation of small-scale renewable energy hubs based on "anchor-business-community" models. Local energy hubs have spun out into electromobility. Clean cooking is achieved through a mix of technologies, including locally produced sustainable biomass and biogas.
Sustainable and integrated transport	Local authorities are empowered to plan regional transport infrastructure development. Electric mobility of various kinds is displacing fossil fuels, and infrastructure to support active travel modes has been developed in cities and towns.

Comparison of scenarios

The scenarios show alternative routes by which the fundamental priorities

To complement the participatory, qualitative scenarios detailed above, quantitative energy modelling was undertaken. This involved quantifying key elements of the and scenarios which focused on the energy system. This included energy demand in industry (i.e. mining), transport and residential sectors, the impacts on overall electricity demand, investment needs, primary energy demand, and emissions.

The scenario has not been quantifed; this is because it was determined that it would fall within the range of metrics provided by and , from which insights could be inferred. In addition to the two main scenarios, a case has also been modelled, which provides a further basis for comparison. It represents a continuation of current trends in respect of underlying drivers of energy demand, such as economic growth and demographics, and the mix of energy used to supply demand. Further information on the key assumptions used in the modelling can be found in Appendix 2.

To analyse the energy implications of the scenarios, the Zambia Open Source Energy Modelling System (OSeMOSYS) model was developed. This is a modelling platform for exploring the evolution of diferent energy system futures to meet specifed energy service demands (Howells et al., 2011). It can provide insights under the diferent scenarios described above as to the level of energy supply needed, the types of technologies that will be needed, the investment requirements of those future systems, and how this impacts the environment, for example CO_2 emissions. It uses a linear optimisation approach to determine least cost
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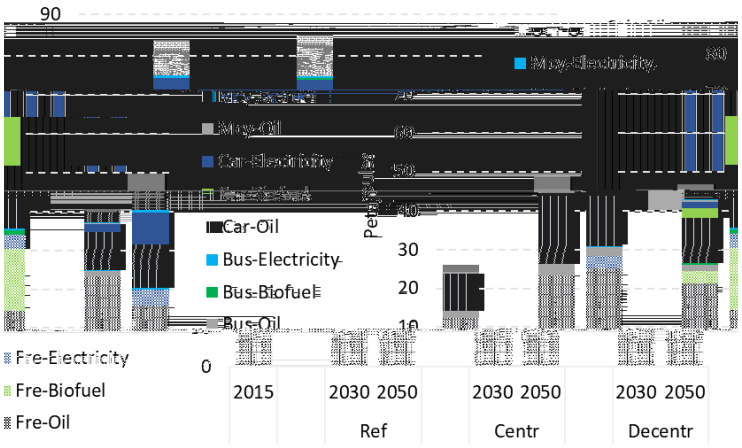
Transport demand.

Transport growth is rapid. Without intervention, reliance on petroleum products is likely to grow. E-mobility, biofuels and increased active transport provide opportunities for preventing increased reliance on oil.

In all the scenarios, the transport sector experiences strong growth in mobility demand, and energy requirements over the coming decades (Figure 2).

The case sees an oil dominated sector, with only small amounts of e-mobility by 2050. In contrast to this, uptake of biofuels alongside e-mobility feature in . Comparable energy levels to are observed in 2050, despite having higher GDP growth. This is because uses energy more e f ciently, due to the uptake of electric vehicles. has much lower energy use in 2050, due to the lower GDP growth (which is an important driver for road freight) but also due to assumptions about the uptake of more active travel and a stronger roll out of pooled transport (i.e. a modal shift from cars to buses). In both scenarios, oil use in freight and cars does persist in 2050. As can be seen in Figure 3b and c, most of the growth in car demand is met by alternatives to oil products, biofuels and electricity in , and electricity in .

Figure 2. Final energy consumption in the transport sectop16.7 6 1c09-20 (r)p16.h.1 (



Overall electricity demand.

If other strategies (such as

Investment.

Large investment is needed for providing access to clean energy over the coming decades, particularly in terms of electricity generation. Support for investment

Emissions.

Zambia can maintain its low carbon energy system whilst growing its economy, but this requires demand side interventions such as energy e f ciency measures in addition to investment in clean energy using technology.

The smaller system size and lower carbon intensity of
results in very low CO_2 emissions from

5. Key messages and conclusions

Through an interdisciplinary approach, this research has investigated the opportunities for and barriers to a green recovery from the COVID-19 pandemic in Zambia. It draws the following key messages from the research:

Climate change and policy in Zambia

A well coordinated and consistent policy environment should underpin climate action. Due to Zambia's geographical and economic structure, the country is vulnerable to disruptions in the supply chain for

Promote cross-sectoral

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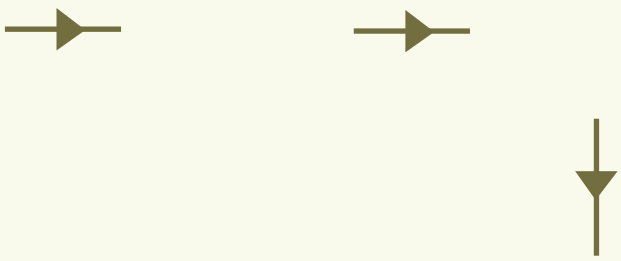
Allington, L., Cannone, C., Pappis, I., Cervantes Barron, K., Usher, W., Pye, S., Brown, E., Howells, M., Zachau Walker, M., Ahsan, A., Charbonnier, F., Halloran, C., Hirmer, S., Cronin, J., Taliotis, C., Sundin, C., Sridharan, V., Ramos, E., Brinkerink, M., … To, L. S. (2022). Selected ‘Starter kit’ energy system modelling data for selg drorA d ‘SS5 lS1m3x9, f, C .r5r, Csi, C5., S Srinh (,)4-12.9 (i)-14.4 (r)-2 C

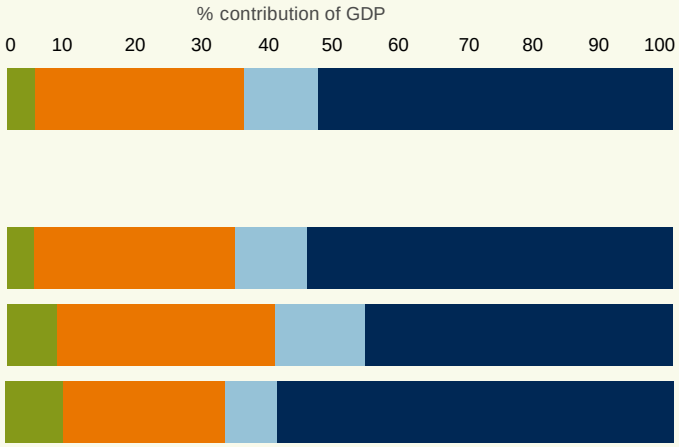
Appendix 1. List of interviewees

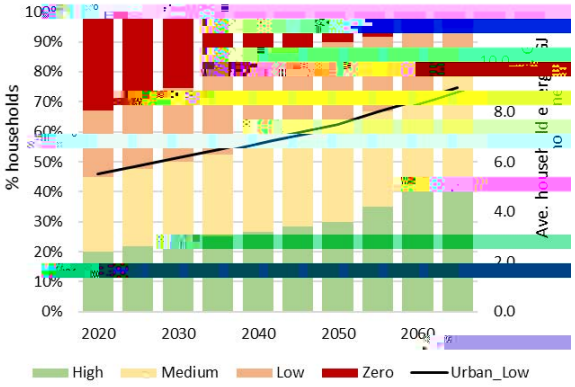
1. Bank of Zambia (BoZ)
2. BioCarbon Partners (BCP)
3. Council of Churches in Zambia (CCZ)
4. Energy Regulation Board (ERB)
5. European Union Delegation to Zambia and COMESA (EU)
6. Indaba Agricultural Policy Research Institute (IAPRI)
7. Innovations for Poverty Action (IPA)
8. Jesuit Centre for Theological Refection (JCTR)
9. Ministry of Agriculture (MoA)
10. Ministry of Energy (MoE)
11. Ministry of Finance and National Planning (MoFNP)
12. Ministry of Labour and Social Security (MLSS)
13. National Designated Authority (NDA)
14. National Resource Sensing Centre (NRSC)
15. Pilot Programme for Climate Resilience (PPCR) Zambia and Transforming Landscapes for Resilience and Development (TRALARD)
16. Non-governmental Gender Organisations' Coordinating Committee (NGOCC)
17. O f ce of the Vice President
18. Policy Monitoring Research Centre (PMRC)
19. Rural Electrifcation Authority (REA)
20. Swedish Embassy in Zambia
21. Women for Change (WfC)
22. World Bank (WB)
23. Zambia Climate Change Network (ZCCN)
24. Zambia Environmental Management Agency (ZEMA)
25. Zambia Institute for Policy Analysis and Research (ZIPAR)
26. Zambia Statistics Agency (ZamStats)
27. University of Zambia – School of Agriculture

Appendix 2. Modelling assumptions

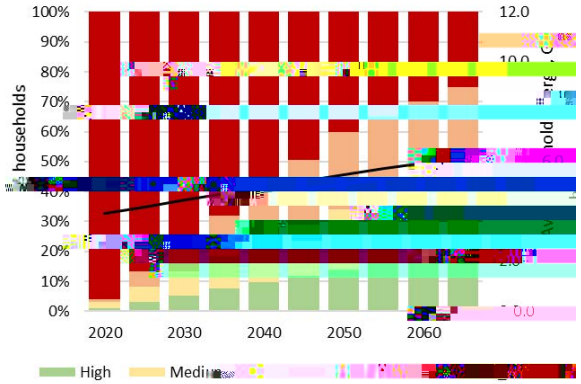


Starting with the exogenous drivers in Table A1, the demographic drivers used only di fer across the scenarios in terms of urban population growth, with assuming a higher share and a lower share. These are variants on the urbanisation trajectory, which is sourced from the UN Urbanisation Prospects dataset. For GDP growth, Thd Thd

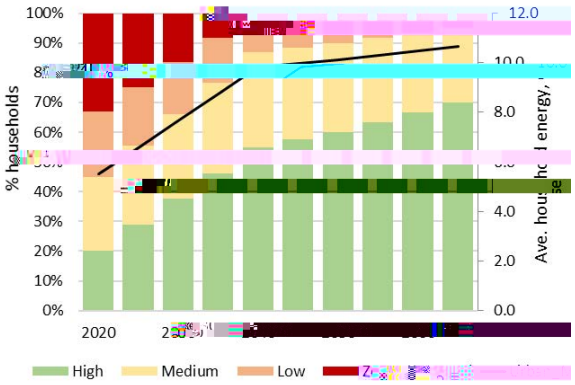




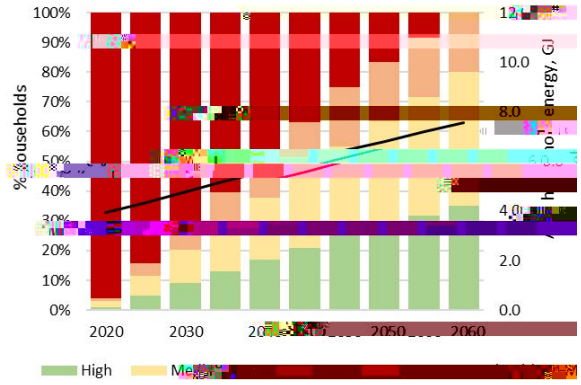
a) Urban – Reference (Low)



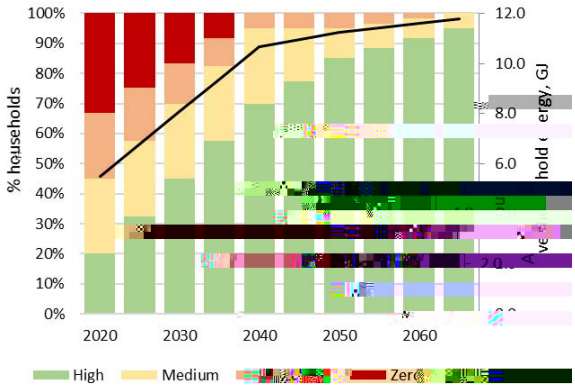
b) Rural – Reference (Low)



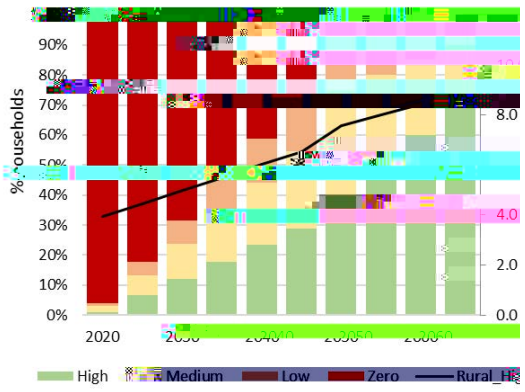
a) Urban – Centralised (Mid)



b) Rural – Centralised (Mid)



a) Urban – Decentralised (High)



b) Rural – Decentralised (High)

Figure A3. Household access to electricity, and level of use. The red bars indicate no access. Orange (low) through green (high) bars indicate increasing levels of consumption. The black trend line shows average household energy use, based on the shares of different household use levels.

Table A2. Energy technology-fuel assumptions by sector. No specifc assumptions are introduced into the model for the Reference scenario.

Sector	Assumption	Centralised	Decentralised
Power generation	Techwy0ygycm0 7lu(o)18.9 (w)14 re52 bogoogo coo		

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