IV.4. No effective policy and legislation direction

As it can be seen from the figure above, most of the participants revealed that the current policy and legislation is not effective when it comes to environmental deterioration. It is believed that the government is not enough explicit and does not assist preventing the environment from deteriorating. From this statement, it can be believed that the environmental risk is not a priority for the government. That means, the government must consider it as a priority to force mining industries to effectively adopt it and efficiently apply it. [55] point out also this barrier by stating that generally government legislation forbids mining sector to destroy the environment with the release of toxic air and water pollution by deploying technologies, which control or clean gas emission from production process. Here as it can be noticed from the graph above most of respondents indicate that the government should enforce the present policy and regulations by being more strict and severe when the mining sectors do not comply. They also state that the safety and protection of the environment is not taken lightly by the government. They continued by claiming that unless SSCM is seriously considered and properly enforced, the current government regulation is a mere intention to protect the environment.

IV.5. High cost associated with the implementation of SSCM

Generally, customers go for least cost; hence this requires the cost involved in incorporating sustainably principles must not be high to allow organizations to offer their products at lower cost. However, research by [22] report that developing SSCM is costly and require a significant amount of funds specifically for small to medium enterprises. [33] also point out that even though most of the small to medium enterprises are aware about the economic benefit that may be generated from making supply chain environ-mentally friendly. But, these enterprises seen cost as the main barrier for developing SSCM in a business organization. As it can be depicted from the figure, respondents strongly agree that cost is a serious concern in implementing SSCM. They believe that if enough funds are allocated for such change, the implementation of SSCM would be feasible. To sum up, respondents agree that the development of SSCM needs significant capital investment because it is a long-term investment. Additionally, SSCM re-quires new world- class technologies, which can easily detect and control the waste produced. That is why, it always says the more you become green, the more you become ex-pensive.

IV.6. Poor Supplier Commitment

Here, the respondent reported that can contribute significantly to the implementation of SCCM. However, suppliers are not fully involved in this process of changing from ordinary supply chain to sustainable one. That means, suppliers are not ready and prepared to partake in this process due to their poor commitment as revealed by respondents. Hence, supplier's commitment can in somehow influence the development of SSCM in mining sector. Therefore, they are ad-vice to demonstrate some intellect regarding the SSCM.

IV.7. Lack of Green Practitioners

From the results above, mining sector in many SADC states members do not have green practitioners. In fact, it was reported by respondent that there are not well-trained and well experienced green specialists. Therefore, it is believed that to effectively develop SSCM, there must be enough green specialists who can do their job well. With the presence of skilled green specialists, organization see a way of cutting costs, increasing competences and demonstrating certain social and environmental responsibility within a professional manner.

IV.8. Poor senior management's commitment

[54] argue that commitment form senior management is extremely significant for the success of any project. In the case of this study, commitment from senior management would be a key driver for environmental protection action. For ex-ample, it can promote and support the activities associated with the development of SSCM. In this sense, participants report that there is a poor commitment from their senior managers concerning the protection of the environment. Their main objective is solely based on economic growth of the company even if they are not environmental friendly. However, if they are competitive in the market they see no problem with environment deterioration. Therefore, this is also a main challenge that hinders the green activities in the mining sector of the SADC region

IV.9. Lack of recycling activities

They respondents report that most mining companies are not engaged recycling activities. Engaging in recycling activities can create economic and environmental advantages for communities especially the waste from mining sector are harmful to human being health. Respondents believe that recycling can play a critical role in mitigating the need

978-1-5090-3924-1/17/$31.00 ©2017 IEEE

for new landfills as well as their related costs. To sum up, respondent indicated that recycling can participate in developing the mining industrial as in most cases the recycled materials are used as raw materials for manufacturing and other utilizations.

IV.10. Lack of Political commitment and support

[54] point out that both political commitment and support are essential factors that can facilitate and influence green activities in mining industries. [52]; and [55] argue that several public and private organizations are experiencing shortage of knowledge and skill for assessing different options in terms of their environmental facets and effects. This might cause all stakeholders feel averse to priorities green activities because they need tangible knowledge of which environmental requirements are important for a specific product group. [15]. [10]; and [4] show that the challenges associated with the assessment involve the ambiguity on how to describe a green product and how to weight the relative significance of various life-cycle performance indicators. Further, there is a perceived shortage of tangible product selection guidance, creating issues in determining greener goods alternatives. Additionally, there is a view of shortage of knowledge or means for possible assessment and follow up of the life cycle oriented information. This backs the idea that there is lack of management and distribution of best practices in many establishments.

IV.11. Lack of managerial support and practical tools

[7]. [8]; [9] discover lack of managerial support and practical tools as an additional cause affecting green activities. [15] on the other hand, look at the private firms fail to implement green activities practices because they do not have regulatory demands and clear regulatory charter for criteria development, assessment and integration, and to com-pare different options and to follow up the supplier performance. [42] point out that comparing to the single principles considerations, the life cycle perspective adds to the complexity of green activities within that the amount and range of acquiring benchmarks is increasing and needs to cover several phases of a product life cycle. The scope is stretched out to consider not only the characteristics of the product per se, however also how it has been manufactured and distributed, and its environmental effect during use and disposal phases. Additionally, the lack knowledge, cost matters and lack of clarity in regulation, business firms indicate poor supplier commitment and industry specific factors.

IV.12. Inadequate individual capacity

Deficient individual capacity is also another barrier preventing the implementation of SSCM. The capacity aspect may be associated with knowledge, understandings over environmental concerns, environmental education. The feeling of incapacity or insufficiency may also stem from an absence of eagerness or rational understanding. [22]; [23]; and [32] recommended managers, as well as procuring managers to have a diversity of attitudes toward environmental concerns, and sometimes also have an indecisive view concerning the potential and immediate costs and gains of green initiatives. Education and particularly training of buyers within public and private organizations needs to become more widespread in integrating SSCM elements in the operations of mining companies.

V. Conclusion and Recommendations

The present study aimed at investigating the challenges hindering the incorporation and implementation of sustain-ability practices into the supply chain activities. The Mining sector in SADC region was selected as a case study. The reasons of conducting such research in SADC mining sector is firstly because there is a lack of research regarding this topic. And secondly, because SADC has got some of the world's richest mineral resources as shown in table 1 above. Two sources of data were used; firstly, primary data was gathered from a survey conducted in five Southern countries. Whilst, the secondary data was obtained from the previous studies done in the same field. After collection and analysis of findings, it has been noticed that there are 12 major challenges that are preventing the development of SSCM such challenges are lack of commitment on environmental deterioration, lack of communication and knowledge sharing, ineffective monitoring and control system, lack of effective policy and legislation direction, high cost associated with the implementation of SSCM, poor supplier commitment, lack of green practitioners, poor senior managements' commitment, lack of recycling activities. It light of this, the following recommendations should be considered: The study recommends that mining industries should organize seminars and workshops to alert all the stakeholders involved concerning the benefits of SSCM and the importance to embrace it. Because, the development of SSCM would be easier when all the stakeholders are informed about advantages of SSCM. Secondly, it is recommended to mining firms to engage in training sessions to enhance the skills and knowledge of their all industries practitioners about SSCM. Because, when all the industries practitioners are well-educated and trained concerning the environmental rules and the policy, therefore will increase awareness and knowledge about the negative impact of mining operations on the environment and how the damage can be mitigated. Thirdly, mining industries should highly

978-1-5090-3924-1/17/$31.00 ©2017 IEEE

consider the level of damage on the environment created by mining operations and it impact on the communities implicates and teaches this philosophy to its personnel who would implement the SSCM vision within the company. Fourthly, the supplier should be fully committed and being involved at earlier stage to understand the principle of green to the community where the suppliers also could think of making the supply of green goods affordable for all customers to ac-quire green goods. This can assist in lessening the global warming due to fact that the users will consume products that are environmentally friendly.

References

[1] Amin C., Amar R& Marc P.2011. Designing supply chains with sustainability considerations, Production Planning & Control, 22:8, 727-741, DOI: 10.1080/09537287.2010.543554

[2] Andreas T & Min T.2015. Information technology for sustainable supply chain management: a literature survey, Enterprise Information Systems, DOI: 10.1080/17517575.2015.1091950

[3] Anna N & Ladimer S.2010. Sustainable supply chain network design: a multi-criteria perspective, International Journal of Sustainable Engineering, 3:3, 189-197,DOI: 10.1080/19397038.2010.491562

[4] Ari P.2010. Consumers' Sustainability Perceptions of the Supply Chain of Locally Produced Food. Sustainability 2010, 2, 1492-1509; doi: 10.3390/su2061492

[5] Babu J., Ting C., Patriya T., Nadia P.2016. Influences of Firm Orientations on Sustainable Supply Chain Management. Journal of Business Research, 69, 3406-3414

[6] Beamon, B. M.1999. 'Designing the green supply chain', Logistics Information Management.

[7] Bloch, R. & Owusu, G. 2012. 'Linkages in Ghana's gold mining industry: Challenging the enclave' thesis. Resources Policy 37, 434–442

[8] Camara, V., Filhote, M., Lima, M., Alheira, F., Martins, M., and Dantas, T.1997. Strategies for preventing adolescent mercury exposure in Brazilian gold mining are-as..ToxicolInd Health, 13(2-3): 285-97.

[9] Carlin, J.2013. Tin: United States geological survey min-eral commodity summaries.

[10] Carter, C. & Easton, P. 2011. Sustainable supply chain management: evolution and future directions. International Journal of Physical Distribution & Logistics Management, 41(1), 46-62

[11] Ceren A.2015. Sustainable Demand Chain Management: An Alternative Perspective for Sustainability in the Supply Chain. 11th International Strategic Management Conference 2015. Procedia -Social and Behavioral Sciences 207, 262 – 273

[12] Chin-Shan L., Po-L & Yi-Pin C.2016. Container terminal employees' perceptions of the effects of sustainable supply chain management on sustainability performance, Maritime Policy & Management, 43:5, 597-613, DOI: 10.1080/03088839.2016.1190471

[13] Christensen, L., & Staalgaard, P., 2004. Support for purchasing and follow-up of green textiles business-to-business (in Danish). No 902 2004- Danish Ministry of the Environ-ment - Environmental Protection Agency.

[14] Chuhua K., Christian N. & Chinho L.2011. Developing global supply chain quality management systems, International Journal of Production Research, 49:15, 4457-4481, DOI: 10.1080/00207543.2010.501038

[15] Craig R. Carter Dale S. Rogers.2008.A framework of sustainable supply chain management: moving toward new theory", International Journal of Physical Distribution & Logistics Management, Vol. 38 Iss 5 pp. 360 – 387

[16] Dadhich P., Genovese A., Kumar N., Acquaye A. 2015. Developing sustainable supply chains in the UK construc-tion industry: A case study. Int. J. Production Economics, 164, 271-284

978-1-5090-3924-1/17/$31.00 ©2017 IEEE

[17] Donna M., Lucy M., Ciarán H & Paul M.2015. Environ-mental and social supply chain management sustainability practices: construct development and measurement, Produc-tion Planning & Control, 26:8, 673-690, DOI: 10.1080/09537287.2014.963726

[18] Edelstein, D. 2013. Copper: United States geological sur-vey mineral commodity summaries.

[19] Fang Y., Lei X., Changyin S., Chun Z.2016. Product transportation distance based supplier selection in sustainable supply chain network. Journal of Cleaner Production, 137, 29-39

[20] Gopal P &Jitesh T.2016. Sustainable supply chain practices: an empirical investigation on Indian automobile industry, Production Planning& Control, 27:1, 49-64, DOI: 10.1080/09537287.2015.1060368

[21] Gunson, A. J., & Jian, Y. 2001. Artisanal Mining in the People's Republic of China. Mining, Minerals and Sustainable Development (74)

[22] Huiping D., Qian L., Lucy Z. 2016. Assessing the economic performance of an environmental sustainable supply chain in reducing environmental externalities. European Journal of Operational Research, 255, 463-480

[23] Janaina D. & Nathalie F.2007.Supply Chain Management and Supply Chain Orientation: key factors for sustainable development projects in developing countries? International Journal of Logistics Research and Applications, 10:3, 235-250

[24] Jeremy H., Stelvia M & Bruno S.2012.Understanding why firms should invest in sustainable supply chains: a complexity approach, International Journal of Production Research, 50:5, 1332- 1348, DOI: 10.1080/00207543.2011.571930

[25] Jianteng X., Yuyu C., Qingguo B.2016. A two-echelon sustainable supply chain coordination under cap-and-trade regulation. Journal of Cleaner Production, 135, 42-56

[26] Joanne B. & Xavier F.2011. Barriers to Tour Operator Sustainable Supply Chain Management, Tourism Recreation Research, 36:3, 205-214, DOI: 10.1080/02508281.2011.11081667

[27] Jonas B. & Joachim Z.2013. Supply chain transparency as a key prerequisite for sustainable agri-food supply chain management, The International Review of Retail, Distribution and Consumer Research, 23:5, 553-570, DOI: 10.1080/09593969.2013.834836

[28] Josef-Peter S., Morgane M., Rupert J. 2016. Toward sup-ply chain-wide sustainability assessment: a conceptual framework and an aggregation method to assess supply chain, performance. Journal of Cleaner Production, 131, 822-835

[29] Julia K., Stefan S., Michael M.2007. Incorporating sustainability into supply management in the automotive industry e the case of the Volkswagen AG. Journal of Cleaner Production 15 (2007) 1053e1062

[30] Jury G & Matteo K.2016.Developing environmental and social performance: the role of suppliers' sustainability and buyer–supplier trust, International Journal of Production Research, 54:8, 2470-2486, DOI: 10.1080/00207543.2015.1106018

[31] Karen S., Richard T & Xavier F.2008. A Sustainable Supply Chain Management Framework for Tour Operators, Journal of Sustainable Tourism, 16:3, 298-314

[32] Kitula, A. 2006. "The environmental and socio-economic impacts of mining on local livelihoods in Tanzania: A case study of Geita District". Journal of Cleaner Production, 405-414.

[33] Konrad Z., Magnus F & Frank S.2016.Sustainable sup-plier management – a review of models supporting sustainable supplier selection, monitoring and development, Inter-national Journal of Production Research, 54:5, 1412-1442, DOI: 10.1080/00207543.2015.1079340

978-1-5090-3924-1/17/$31.00 ©2017 IEEE

[34] Kusi-Sarpong, S., Sarkis, J., Wang, X & Filho, W.2014. Sustainable Supply Chain Management Practices in Ghana's Mining Industry. Working Paper WP2-2014

[35] Majid E., Pierre D., Joe M. Olivier P.2015. Sustainable supply chain network design: An optimization-oriented re-view. Omega, 54, 11-32

[36] Marco F., Paolo T. 2016. Corporate sustainability approaches and governance mechanisms in sustainable supply chain management. Journal of Cleaner Production, 112, 1920-1933

[37] Munnik, V. Hochmann, G. Hlabane, M. & Law, S. 2010. The Social and Environmental Consequences of Coal Min-ing in South Africa, Cape Town.

[38] Natalia Y., Joseph S & Thomas S.2012.Sustainable benchmarking of supply chains: the case of the food industry, International Journal of Production Research, 50:5, 1297-1317, DOI: 10.1080/00207543.2011.571926

[39] Nisakorn S &Tritos L.2016. Prioritization of applicable drivers for green supply chain management implementation toward sustainability in Thailand, International Journal of Sustainable Development & World Ecology,DOI: 10.1080/13504509.2016.1187210

[40] Olson, D.W., 2013. Diamond (industrial): United States geological survey mineral commodity summaries 201.

[41] Panchanan B. & Anand P.2015. Understanding Construction Supply Chain Management, Production Planning & Control, 26:16, 1332-1350, DOI: 10.1080/09537287.2015.1045953

[42] Paolo T., Patrizia G., Sai S., Flavio T & Roberto P. 2015. A review of decision-support tools and performance measurement and sustainable supply chain management, Inter-national Journal of Production Research, 53:21, 6473-6494, DOI: 10.1080/00207543.2014.939239

[43] Papp, J.2013. Tantalum: United States geological survey mineral commodity summaries.

[44] Paweł S & Jarosław W.2015. A hybrid framework for the modelling and optimisation of decision problems in sustainable supply chain management, International Journal of Production Research, 53:21, 6611-6628, DOI: 10.1080/00207543.2015.1005762

[45] Payman A., Cory S., Mohamad Y.2016.Energy-related performance measures employed in sustainable supply chains: A bibliometric analysis. Sustainable Production and Consumption, 7, 1-15

[46] Peck, P. & Sinding, K. 2003. Environmental and social disclosure and data richness in the mining industry. Business Strategy and the Environment 12,131-146

[47] Petrică C., Camelia M., Corina P., Mara H.2015. An efficient Reverse Distribution System for solving sustainable supply chain network design problem. Journal of Applied Logic, 13, 105-113.

[48] Rameshwar D & Angappa G.2016. The sustainable humanitarian supply chain design: agility, adaptability and alignment, International Journal of Logistics Research and Applications, 19:1, 62-82, DOI: 10.1080/13675567.2015.1015511

[49] Rozar, N. M., Mahmood, W. H., Ibrahim, A., & Razik, M. A. 2013. A Study of Success Factors in Green Supply Chain Management in Manufacturing Industries in Malaysia. Journal of Economics, Business and Management, 3 (2), 2-7.

[50] Seuring, S.,&Müller, M. 2008. From a literature review to a conceptual framework for sustainable supply chain management. Journal of cleaner production, 16(15), 1699-1710

978-1-5090-3924-1/17/$31.00 ©2017 IEEE

[51] Shaofeng L., Jonathan M., Phil M., Dulekha K &Uchitha J.2014. A knowledge chain management framework to sup-port integrated decisions in global supply chains, Produc-tion Planning & Control, 25:8, 639-649, DOI: 10.1080/09537287.2013.798084

[52] Sunil L., Dixit G &Abid H.2015. Critical success factors of green supply chain management for achieving sustainability in Indian automobile industry, Production Planning & Control, 26:5, 339-362

[53] Susanne F.2013.Calculating sustainability in supply chain capitalism, Economy and Society, 42:4, 571-596, DOI: 10.1080/03085147.2012.760349

[54] Walker, H, Di Sisto, L, & McBain, D. 2008. Drivers and barriers to environmental supply chain management practices: Lessons from the public and private sectors. Journal of Purchasing and Supply Management, 14(1), 69-85.

[55] Wan N., Jafar R., Marisa P., Lóránt A.2016. The influence of external factors on supply chain sustainability goals of the oil and gas industry. Resources Policy, 49, 302-314

[56] Warhurst, A. 1999. Mining and the Environment: Case-Studies from the Americas. VA: May: Stylus Publishing.

[57] Xun X & Dogan G.2015. A Conceptual Framework of Sustainable Hospitality Supply Chain Management, Journal of Hospitality Marketing & Management, 24:3, 229-259, DOI: 10.1080/19368623.2014.909691

[58] Yelpaala, K. 2004. Mining, Sustainable Development and Health in Ghana: The Akwatia Case-Study. U.S.A: Brown University.

[59] Yılmaz B., Hasan S. 2016. Sustainable design of renew-able energy supply chains integrated with district heating systems: A fuzzy optimization approach. Journal of Cleaner Production, 133, 863-885

[60] Zhalechian M., Tavakkoli M., Zahiri B., Mohammadi M.2016. Sustainable design of a closed-loop location-routing-inventory supply chain network under mixed uncer-tainty. Transportation Research Part E, 89, 182-214

[61] Zhonghua Z & Anjali A.2014. Modelling customer and technical requirements for sustainable supply chain plan-ning, International Journal of Production Research, 52:17, 5131-5154, DOI: 10.1080/00207543.2014.899717

[62] World Bank, .2015. Doing Business 2015: Going Beyond Efficiency. Washington, DC: World Bank

Biography

Ndala Yves Mulongo is currently conducting a PhD degree in Quality and Operations Management, Faculty of Engineering and the built environment, University of Johannesburg. He holds bachelor of engineering in extraction metallurgy and master of engineering in engineering management from University of Johannesburg, South Africa. His research interests involve cost of electricity production, energy efficiency measures, green supply chain management, impact of mining operations on environment, mineral processing, manufacturing processes.

Dr Pule Kholopane is currently a Senior Lecturer and Head of Department in the Department of Quality and Operations Management, Faculty of Engineering and the Built Environment, University of Johannesburg, South Africa. He has both industrial and academic experience for more than twenty years. He has got a Doctorate of Engineering degree from the University of Johannesburg where he has been supervising masters and PhD students during the current decade. He has published several journal and conference research papers. His research areas include project management, process optimizations, manufacturing processes, supply chain management, sustainability, production planning, energy efficiency, waste reduction, product development and marketing, product quality related issues, cost analysis, etc.

978-1-5090-3924-1/17/$31.00 ©2017 IEEE