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ANALYSIS OF THE POTENTIAL CONTRIBUTIONS OF COLLULI POTASH PROJECT TO SUSTAINABLE DEVELOPMENT GOALS IN ERITREA

Final Report
January 2019

About the document.

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COLLULI POTASH PROJECT IN ERITREA

Colluli Potash Project (Colluli or the Project) is located in the Danakil Depression region of Eritrea, East Africa and is 100 per cent owned by the Colluli Mining Share Company (CMSC). CMSC is a 50:50 Joint Venture between Danakali Limited (a limited company listed on Australian Stock Exchange) and the Eritrean National Mining Company (ENAMCO).

Since exploration commenced at Colluli in early 2010, over 1 billion tonnes of high grade potassium bearing salts suitable for the production of potash have been identified. The potassium bearing salts of the Danakil Depression offer the unique capability of producing a diverse range of potash types including muriate of potash (MOP or potassium chloride), sulphate of potash (SOP or potassium sulphate), and sulphate of potash magnesia (SOP-M or potassium magnesium sulphate).

Sulphate of potash (SOP) is a highly valued, chloride free, premium potash fertiliser with few primary production facilities globally. SOP contains both potassium and sulphur which are essential crop nutrients.

Following the positive outcomes of a prefeasibility study (PFS) for the production of sulphate of potash (SOP) in February 2015 and a definitive feasibility study (DFS) that was completed in November 2015, a front-end engineering design (FEED) study was completed in January 2018 for a modular SOP development project.

Phase I [2020-2025]
In this phase, the Colluli project is expected to produce 472 kilo tonnes per annum (ktpa) of premium SOP product;

Phase II [After 2026]
From year 6 of the Project, production is expected to increase total SOP production to 944ktpa.

FEED provides off-takers and funders with a high level of detail, accuracy and confidence, and provides a robust platform for project execution. FEED estimates a positive post-tax project NPV and post-tax IRR of 29.9% for Colluli.

According to the documents of Danakali, there is no other known SOP greenfield development project that has completed FEED.

Colluli meets the criteria for a Tier 1 project:
•Industry leading capital intensity;
•Forecast first quartile operating costs;
•Proximity to coast and global markets;
•Outstanding grade; and
•Exceptionally long mine life (approximately 200 years).

Colluli is the shallowest evaporite deposit in the world, with mineralisation starting at just 16m, allowing open-cut mining. Based on current global potash production pattern, it appears that Colluli is the only SOP resource that allows extraction of potassium salts in solid form. Usually, primary production of SOP typically comes from potassium rich brines, which require considerable evaporation. Extracting the salts in solid form provides superior economic outcomes: it enables the salts to be processed immediately, significantly reducing the time between mining and revenue generation; and it reduces the evaporation pond footprint contributing to a lower capital intensity.

The processing method to be utilised at Colluli is the most commonly used, low cost process for production of SOP. Colluli salt composition is ideal for low energy, high yield conversion to SOP at ambient temperatures. Colluli is the closest SOP deposit to a coastline, only 75km from the Red Sea coast (where a new off take terminal can be built in the future.)

Colluli is located 230km from the established port of Massawa which is equipped with bulk and container loading facilities.

Acknowledgements

We would like to acknowledge with much appreciation the crucial role of the staff of UNDP in Eritrea, who gave us the necessary support and guidance to complete this study. Many thanks go to government's officials of Eritrea including representatives of Ministry of Agriculture, Ministry of Mine and Energy and Ministry of Finance for their insights, point of views and orientation to better understand the context in Eritrea. We also appreciate the support of Colluli and Danakali's executives for the data, information, comment, and advices provided and representatives of VITA.

Consultants

- Cristian Parra is an economist with over twenty years of experience in the analysis of mining and socio-economic development issues having worked in 15 countries with global resources companies, international institutions, development organisations (World Bank, UNDP, GIZ among others), universities, research centres and governments.

- Dr P Anand is an environmental economist with over thirty years of experience in the analysis of human development, the capability approach, corporate social responsibility, sustainable cities and public policy analysis. He has contributed to research studies and knowledge development for international organisations including the UNDP, Asian Development Bank, the African Development Bank and the Aga Khan Foundation.

Highlights

9 Key Factors

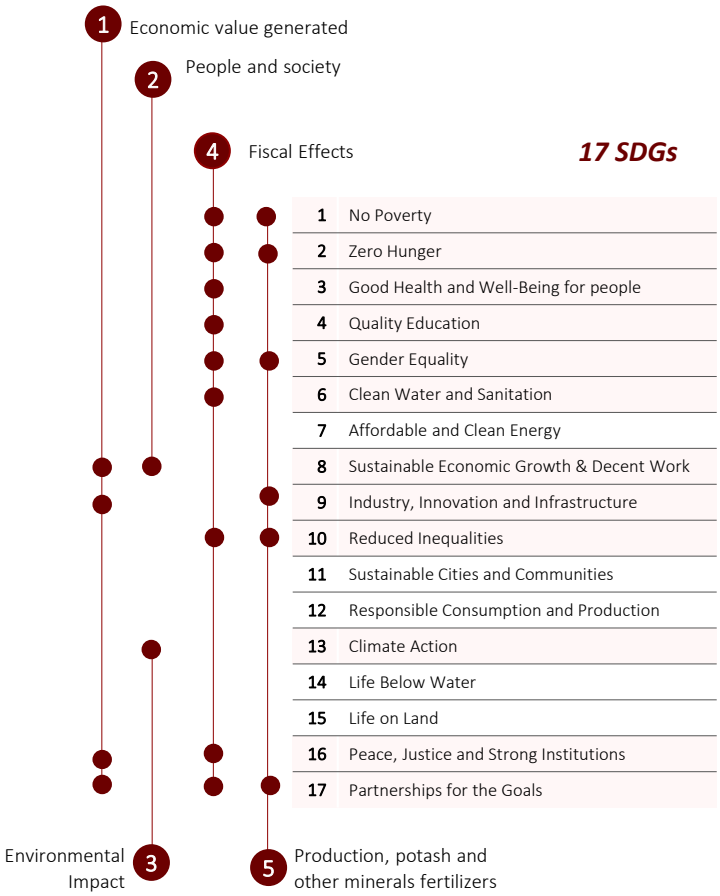
for Successful Development and Positive Impacts

1	Location & Deposit Characteristics
2	Production, costs & technology
3	Key plant macronutrient & multi-commodity potential
4	State Participation
5	Corporate Policies & Principles: CSR, Social Impact and Social Investor.
6	Strong International Demand for Fertilizer
7	Explicit commitment to SDGs
8	Partnership & Alliances
9	Controlled and reduced social and Environmental impacts in the area of influence

Significant Economic Effects 2018-2030 (potential)

Exports: 50% Eritrean Exports by 2030
Exports: US$537 by 2030
Direct Capex and other investment: US$ 614 (2018-2030)
GDP: 3% of Eritrean GDP by 2021
Local Procurement: US$189 a year by 2026
Impact on Agriculture productivity
Indirect employment linked to Colluli: +/-10.000 people
Fiscal Effects: $204m a year by 2026

5 areas of Direct Impact and High Potential of Positive Contribution on 13 SDGs



Executive Summary

This study titled 'Analysis of the Potential Contributions of Colluli Potash Project to Sustainable Development Goals in Eritrea' is sponsored by The United Nations Development Programme (UNDP). UNDP has identified Colluli Potash Project as a strategic opportunity to enhance the delivery of the 2030 Agenda and the UN Sustainable Development Goals (SDGs).

The young nation of Eritrea is presently undertaking a major project to extract potash and various associated products in the Colluli region of the Danakil depression. The proponents suggest that due to many reasons this project can be a world-class asset: a very large resource, existence of minerals very close to the surface, availability of potash in its highly valued Sulphate of Potash (SOP) form, only 235 km from the port, located in East Africa with easy access to large existing and future markets and the potential to transform agriculture and food security of Africa.

The Colluli Mining Share Company (CMSC) is a 50:50 joint venture between the Government of the State of Eritrea and Danakali Limited a company listed on the Australian Stock Exchange. Such 50:50 partnerships right from early stage of projects are rare in mining sector especially in Africa. In addition to the financial resource flows, there is an additional dimension. Because the project outputs are fertilisers, the project has the potential to benefit in Eritrea and Africa.

The analysis of direct impacts of Colluli Potash Project and its potential contributions to the sustainable development agenda in Eritrea is focused on five main areas: economic value generated; people & society; the environment; fiscal effects; and effects linked to production of potash and other mineral fertilizers.

The analysis shows the main impacts of Colluli are: exports of US$ 537m that could represent 50% of Eritrean Exports by 2030; Direct Capex and other investment: US$ 614 (2018-2030); GDP: 3% of Eritrean GDP by 2021; Local Procurement: US$189 a year by 2026; Impact on Agriculture productivity; Indirect employment linked to Colluli: +/-10.000 people and Fiscal Effects of : $204m a year by 2026.

Because of these impacts and Colluli's corporate policies the project has the potential to generate significant effects on Sustainable Development Agenda of Eritrea in particular on 13 specific SDGs due to natural synergies with most of them.

The final effects on SDGs will be highly connected to fiscal impacts and effects that will be generated by Colluli's final products.

Use of some of the SOP to Eritrean farmers can transform Eritrean agriculture especially of high value vegetables, fruits and cash crops. Fertiliser can also be tool of diplomacy to promote food security in Africa.

This mining project alone cannot transform the entire economy. However, because of the size of the deposit, there is significant potential to boost the national economy and to transform agriculture. It is through these complex pathways the impact of this project will translate into the final SDG outcomes. While it is not possible to calculate and show with certainty what these final effects could be (because many of them depend on assumptions about specific interventions in terms of policies and programmes), in this study we have attempted to estimate the more discernible impacts on SDGs. Further work needs to be done on this with detailed empirical models and data.

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1.1 About this study

This study titled 'Analysis of the Potential Contributions of Colluli Potash Project to Sustainable Development Goals in Eritrea' is sponsored by The United Nations Development Programme (UNDP) which is one of the largest UN development partners in Eritrea. UNDP has identified Colluli Potash Project as a strategic opportunity to enhance the delivery of the 2030 Agenda and the UN Sustainable Development Goals (SDGs).

This report has the following structure:

Section 1 presents the study details and objectives.

Section 2 introduces the Colluli Potash Project.

Section 3 briefly summarises the context of Eritrea.

Section 4, the main section of the report presents the analysis of direct impacts of Colluli and the potential contribution to SDGs.

Section 5 presents a summary of the potential impacts and contributions of Colluli on SDGs.

This study was carried out during the first semester of 2018.

Sustainable Development Goals

The Sustainable Development Goals (SDGs) are a collection of 17 global goals set by the United Nations. The broad goals are interrelated though each has its own targets to achieve. The total number of targets is 169. The SDGs cover a broad range of social and economic development issues. These include poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanization, environment and social justice.

The SDGs are also known as "Transforming our World: the 2030 Agenda for Sustainable Development" or 2030 Agenda in short. They are also known as the Global Goals for Sustainable Development.

The goals were developed to replace the Millennium Development Goals (MDGs) which ended in 2015. Unlike the MDGs, the SDG framework does not distinguish between "developed" and "developing" nations. Instead, the goals apply to all countries.

Paragraph 54 of United Nations General Assembly Resolution A/RES/70/1 of 25 September 2015 contains the goals and targets. The UN-led process involved its 193 Member States and global civil society. The resolution is a broad intergovernmental agreement that acts as the Post-2015 Development Agenda.

The SDGs build on the principles agreed upon in Resolution A/RES/66/288, entitled "The Future We Want". This was a non-binding document released as a result of Rio+20 Conference held in 2012.

UNDP

1.2 Colluli Potash Project in Eritrea: *A potential paradigm change in the resource industry*

During the last two decades, mining activities and the globalised extractive industry of non-renewable natural resources have played a significant yet controversial role in the development agenda of resource rich countries (both developed and developing). Multi-national extractive corporations have been striving to better understand their socioeconomic effects, manage externalities and improve their policies and environmental and social performance.

Various protests and citizen movements that highlighted exploitative nature of extractives on the one hand and evolution of corporate social responsibility standards led to sophisticated tools, guidelines and corporate standards being developed and implemented to enhance mining operations throughout the entire life cycle of activities and operations. Better planning with engagement of stakeholders right from the project initiation, more transparent and detailed impact assessments, enhanced decision making processes related to project affected communities, better corporate monitoring and reporting, and improved due diligences in line with regulatory requirements are traditional examples in this direction.

Though these improvements are on the right track, the expectations and demands of social justice (beyond particular legal requirements) from governments, civil society, project affected communities, international organizations, and wider stakeholders in general, are also growing in quantity and complexity across multiple and diverse dimensions such as: economic, fiscal, social, cultural, and environmental aspects among others. When the specific expectations are not properly addressed, mining projects and activities in resource rich regions (notwithstanding their tremendous potential to generate economic benefits in terms of GDP, investment, exports, local procurement, employment and fiscal impacts) could face delays or even cancellation due to difficulties in raising necessary capital finance.

From an corporate perspective this situation has led to higher financing costs, increased uncertainty in planning, and sometimes the need to take very high level of business risks. From a societal perspective (especially in developing countries and local communities in the area of influence of the projects) this unfortunately represents missed opportunities for development and social progress.

In this context, the first step to find a satisfactory long-term solution is to continue working to improve standards, corporate principles, regulations, and achieving a better understanding of the mining industry's impacts and its role as an economic driver, and how, in general, mining activities and projects are or will be connected to host societies.

However, it is also absolutely necessary to take an additional and significant step ahead in the relationship between resource industry and society, and developing mining that can demonstrate a real commitment with local development agenda and sustainable development goals of the host country.

The analysis of direct impacts of Colluli Potash Project and its potential contributions to the sustainable development agenda in Eritrea is extremely relevant considering that Colluli could have significant positive effects as an economic driver, but also in terms of how to understand mining contributions to sustainable development.

1.3 SDGs & Extractive Industries

The thinking about extractive industry and how it can contribute to Sustainable Development Goals is evolving. At present, many principles and ideas are available from international institutions and organizations such as the International Council of Mining and Metals (ICMM) Principles and Guidelines, UN Global Compact principles, World Business Council for Sustainable Development, and the World Economic Forum White Paper on Mapping Mining to the Sustainable Development Goals. These are taken into account in developing the conceptual framework for the analysis in this study.

Extraction of non-renewable natural resources can be an important source of direct impacts in host societies where such extractive projects are located. These impacts can come in the form of employment, salaries, acquisition of goods and services of domestic firms through local procurement, taxes and fiscal payments, investments on local infrastructure, direct social investment and the implementation of corporate policies.

However, from the perspective of individuals and communities, these direct impacts should not be considered as final outcomes, and it is necessary to understand that by themselves these impacts are insufficient to achieve real development goals such as improvements in the quality of life of the majority of the population or improvement in basic social conditions of the most vulnerable groups in society.

Experience of countries that have managed extractive resources successfully suggests that this can only be achieved through the coordination of policy makers, local and national government, civil society, international development agencies, community representatives and mining companies. Together it is possible to build a shared vision about the future and to formulate an agenda of complementary policies, strategies and actions that transform natural resource extraction into real development and social progress.

Mapping Mining to the SDGs:

The World Economic Forum, Columbia Centre on Sustainable Investment and UNDP together produced an important (but initial and basic) document in 2016 titled Mapping Mining to the SDGs. It is presented in the form of an atlas focusing on each of the SDGs.

The study notes that while mining activities have potential to contribute to all 17 SDGs, there are some opportunities to leverage.

The environmental sustainability dimension can contribute to SDG6 on Water and Sanitation and SDG7 on Energy. The social inclusion dimension of mining can contribute to SDG1 (End poverty), SDG5 (gender equality), SDG10 (reducing inequality) and SDG16 for peaceful and just societies. The economic development dimension of mining can contribute to SDG8 on decent work, SDG9 on infrastructure and innovation and SDG12 on responsible production and consumption. The report exhorts:

> "…To realize the full potential for contributing to the achievement of the goals, mining companies must continue to work to integrate changes into their core business and, along with the mining industry as a whole, bolster collaboration, partnership and meaningful dialogue with government, civil society, communities and other stakeholders."

1.4 Study Objectives, Methodology and Activities

The analysis will examine at macro level forecasts of possible direct economic, social and environmental impacts, and the effects of Colluli production (fertilizers) (Objective 1), and based on these identify and visualise the potential contributions to Sustainable Development Goals in Eritrea (Objective 2).

Findings of this study are expected to inform discussions about the magnitude of the Colluli project impacts. An analysis by outsiders can be easily criticised as lacking in the in-depth knowledge of history, context, culture and institutional understanding. On the other hand, this can also be an advantage in that external subject experts can bring international comparative understanding. Such external perspective also fits with the principles of corporate governance, transparency and knowledge production in a global development context without any trappings of post-colonial mindset. The findings of this analysis are mainly to contribute to a broader discussion by all stakeholders.

Table 1 Objectives of this Study

1	To analyse at macro-level the potential direct impacts of Colluli in five areas: • Economic value generated • People and society • Environmental • Fiscal effects • Production, potash and other minerals fertilizers
2	To identify and visualize the potential contribution of Colluli to Sustainable Development Goals.

Source: Analysis developed by this Study

Methodology
Conceptual Framework for the analysis

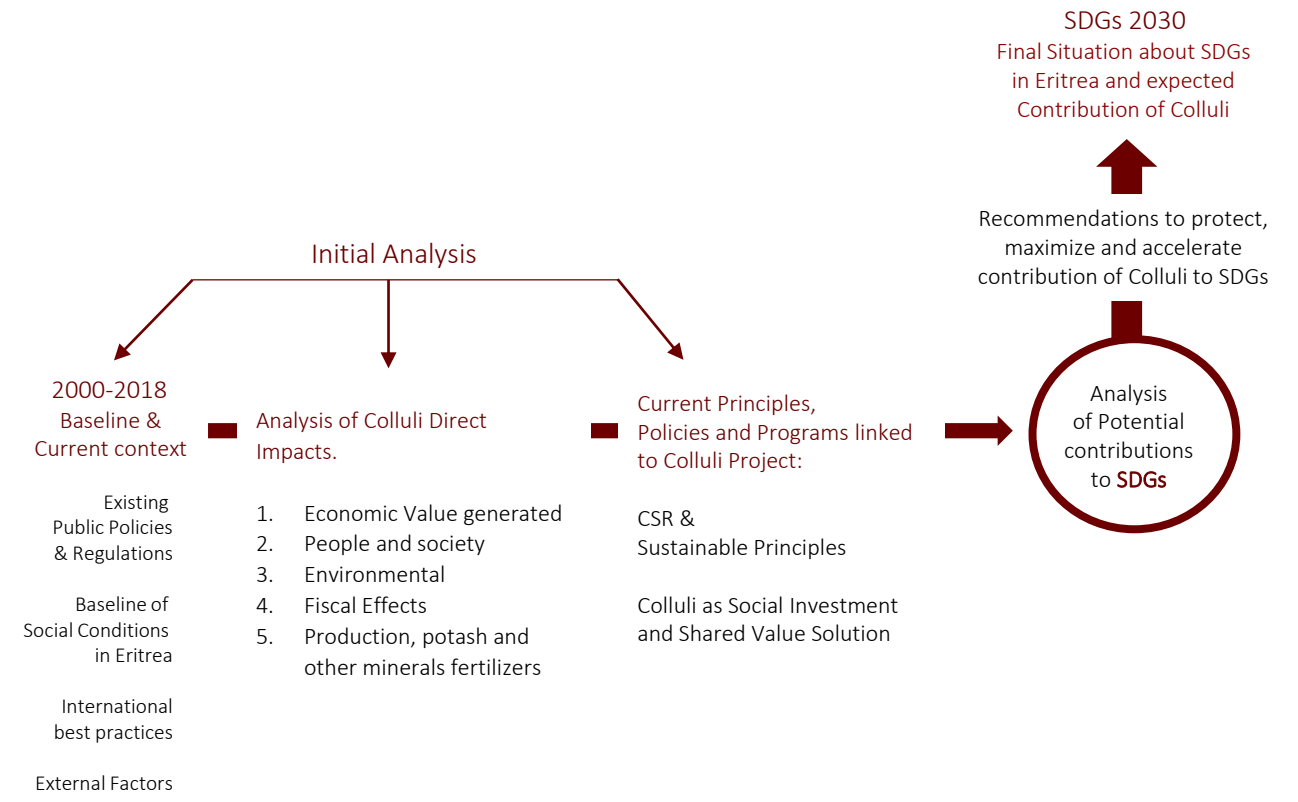
The impact analysis of non renewable natural resources represents a significant methodological challenge, where it is necessary to incorporate a review of the meaning of the impacts and an effective approach to understand the potential effects on host societies and communities.

This study analyses the direct impacts of Colluli, its related baseline and current socioeconomic context, and current principles, policies and programmes established for Colluli.

This initial analysis will build a baseline of information to understand Colluli's potential contribution to SDGs, establish recommendations and visualize the complete potential contribution to Eritrean Development Agenda by 2030.

A tailored conceptual methodological framework for the analysis is presented in Figure 1.

Figure 1 Conceptual Methodological Framework for the Analysis



Source: Analysis developed by this Study

Analysis of Colluli Potential Contribution to SDGs

In general, the potential contribution to sustainable development goals generated by economic activities or specific interventions could be analysed from different perspectives. Thus, the final effects in terms of intensity, length and the nature of distribution of impacts in terms of direct impacts on persons and communities affected but also many indirect impacts should be understood and assessed as a composite formula of different factors.

This is an extremely complex task beyond the traditional analysis of impact assessment based on identification of specific changes. An assessment of progress in terms of Sustainable Development Goals agenda, should include quantitative and qualitative tools for two distinct purposes: one to incorporate analyses of past trends, baseline information, estimations and projections; evaluation of correlations and causalities and establishing a point of reference to evaluate progress on specific dimensions; and the second to develop relevant ethical framework of principles and values (so as to avoid falling in the trap of conducting impact assessment essentially to prove the worth of a given intervention or activity and miss the social and macro-level consequences).

A related objective of this study is to visualize the potential contribution of Colluli to SDGs by identifying which specific SDG targets could have a direct link to the specific impact of Colluli based on the analysis of projections of its direct impacts (Economic Value Generated, People & Society, Environment, Fiscal Impact and Production).

Thus, the logic for this study is: understanding the Colluli project effects that directly contribute to SDGs (for example employment, environmental impacts) and understanding how the other direct and indirect impacts of the project can lead to SDGs through different channels (for example, fertiliser → improved agricultural productivity → potential contribution to SDG on zero hunger).

Activities and data collection

Activities of the study were organized following mixed approaches for data collection using both primary and secondary sources. The primary sources were interviews with key stakeholders from the Government of the State of Eritrea, the Colluli Mining Share Company and its promoters, namely Danakali Limited and ENAMCO and other relevant representatives of the civil society as identified by the primary stakeholders. The study also used desk based literature review, analysis of secondary sources of data and other relevant reports of UN agencies in Eritrea and other development institutions. The consultants complemented data collection and its analysis with appropriate assumptions, inferences and estimations.

Engagement activities with primary stakeholders includes: formal meetings with UNDP-Eritrea; interviews with key representatives of the relevant ministries of the Government of State of Eritrea; interviews with Danakali company representatives and other development partners.

Table 2 Engagement and activities in Eritrea

Stakeholder	Topics
Meetings with UNDP-Eritrea and coordination among consultants	Discussions with UNDP Programme Officer and presentations to UNDP staff members.
Interviews with key stakeholders	Government officials Ministry of Agriculture Ministry of Finance Ministry of Energy and Mines ENAMCO Executives Colluli Project (Danakali) Country Manager CFO and CEO Private sector in Eritrea Local contractors A reputed audit firm

Source: Analysis developed by this Study

2 Colluli Potash Project

2.1 Colluli Project

Colluli is located in the Danakil Depression region of Eritrea and is approximately 230km by road south-east of the port of Massawa, which is Eritrea's key import/export facility. The Danakil Depression is an emerging potash province, which commences in Eritrea and extends south across the border into Ethiopia.

Colluli is located approximately 75km from the Red Sea coast, providing unrivalled future logistics potential. The Project resides on the Eritrean side of the border, giving Colluli a significant advantage relative to the other potash development projects in the Danakil Depression, which need to ship from the Tadjoura Port in Djibouti – over 790km by road from the closest project on the Ethiopian side of the border. Colluli boasts the shallowest evaporite mineralisation globally and consequently has significant mining, logistics and, in turn, capital and operating cost benefits over other potash development projects in the Danakil Depression and elsewhere.

The resource is amenable to open-cut mining: a proven, high productivity mining method. Open-cut mining provides higher resource recoveries relative to underground and solution mining methods, and is generally safer and more easily expanded.

The Project carries a significantly lower level of complexity due to predictable processing plant feed grade, predictable production rates – given low reliance on weather conditions – and simple, commercially proven mineral processing technology.

Colluli is fully permitted following the signing of the Mining Agreement in February 2017; and the subsequent awarding of the requisite Mining Licenses. The project is rapidly progressing to construction.

The Colluli resource comprises three potassium bearing salts in solid form: sylvinite, carnallitite and kainitite. These salts are suitable for high yield, low energy production of SOP, which is a high quality potash fertiliser carrying a price premium over the more common MOP. Potassium sulphate has limited production centres around the world and is suitable for application to fruits, vegetables, coffee plants and other chloride intolerant crops.

The salt composition in the Danakil region also provides the ability to produce a suite of potash products including SOP, Sulphate of Potash-Magnesia (SOP-M) and MOP. Such potash product diversification cannot be achieved by any other known potash region in the world.

The JORC-2012 compliant mineral resource estimate for Colluli stands at 1.289Bt @ 11% K2O for 260Mt of contained SOP. The JORC-2012 compliant ore reserve estimate for Colluli stands at 1.100Bt @ 10.5% K2O for 203Mt of contained SOP. The Measured and Indicated Mineral Resources are inclusive of those Mineral Resources modified to produce the Ore Reserves.

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2.2 Factors for a Successful Formula for Development

Based on an analysis of the Environmental Impact Study of Colluli Potash Project, financial information provided by the company, and public information of Danakali, this study identifies nine interconnected factors or characteristics of Colluli that can shape a successful formula in terms of positive impacts for Eritrea and effectively connect the project with the development agenda of Eritrea.

These include: the location, production technology, the nature of products and multi-commodity potential, state participation, corporate policies, effects on agriculture and food security; fiscal effects; explicit commitment to sustainable development agenda and SDGs in Eritrea through corporate policies based on shared value solutions and Colluli as a Social Investor; and from the foundations of Colluli the establishment of programmes and alliances based on international cooperation and partnership for development (Table 3)

Table 3 Overview of the Key Factors for Positive Impacts

1	Location & Deposit Characteristics
3	Production, costs & technology
2	Key plant macronutrient & multi-commodity potential
3	State Participation
5	Corporate Policies & Principles
6	Strong International Demand for Fertilizer
7	Explicit commitment to SDGs
8	Partnership & Alliances
9	Controlled and reduced social and environmental impacts in the area of influence

1. Economic Value Generated
2. People and Society
3. Environment
4. Fiscal Effects
5. Agriculture and Food Security
6. Agriculture and Food Security Beyond Eritrea

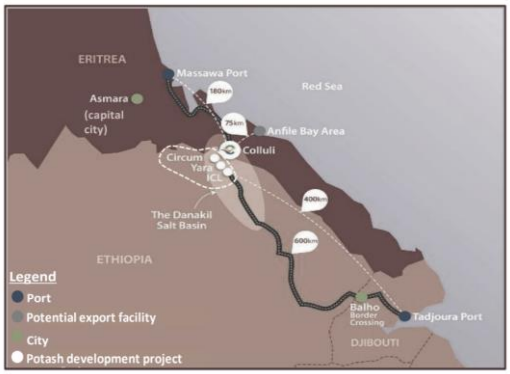
Source: Analysis developed by this Study

Table 4 Key Factors for a Successful Formula for Development and Positive Impacts of Colluli Potash Project in Eritrea

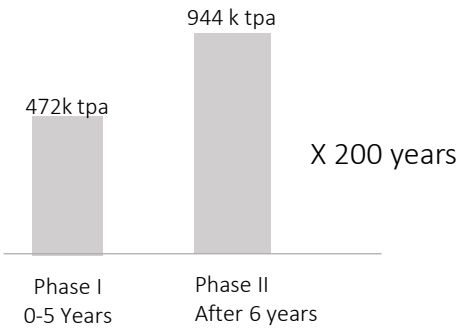
	Factors	Comments
1	Location & Deposit Characteristics	High quality SOP close to the surface (17 metres) and mine location close to the coast (75 km)
2	Production, costs & technology	Colluli's technological design have the potential to generate stable and long term operational stability.
3	Potash resources and & multi-commodity potential.	Colluli is the Africa's first potash resource and world-class potash resource (mineral fertilizer) located in the Danakali desert in South-East Eritrea. Considering fertilizer consumption is a fundamental pillar to increase productivity in Agriculture, and Agriculture is the most important economic activity in Eritrea (Employment in Agriculture represent 60% of the labour force in Eritrea). The final formula of Colluli' products distribution in Eritrea will have a significant effects on Food security. In addition, Colluli has the potential to produce different and complementary commodities.
4	State Participation	The Colluli Project is owned by the Colluli Mining Share Company (CMSC). CMSC is a 50:50 Joint Venture, between Danakali Limited, an Australian exploration company and the Government-owned Eritrean National Mining Company (ENAMCO).
5	Corporate Policies & Principles	Colluli's operations has been designed and structured based on three particular corporates policies and principles: CSR & sustainable Principles Colluli as Social Investment Company
6	Strong International Demand for Fertilizers	Growing population and growing fertilizer demand to improve productivity in agriculture.
7	Explicit commitment to SDGs	Colluli through its Owners (Danakali, ENAMCO) has expressed a commitment to connect Colluli to Sustainable Development Agenda in Eritrea.
8	Partnership & Alliances	Colluli and the Eritrea Ireland Development Partnership has been working to develop and implement the program: "Soil Fertility, Food Security and Climate Action" partnership in Eritrea and in Africa, supported by world class science and development partners as well as by development grants and concessional loan and equity finance
9	Controlled and reduced social and environmental impacts on the area of influence	Because of its location Colluli will have a controlled impacts from the perspective of communities around the area of influence and from a environmental perspective. Also, Colluli is committing to be a carbon-neutral potash mine through its offsetting programme of community water and energy management programmes.

Source: Analysis developed by this Study

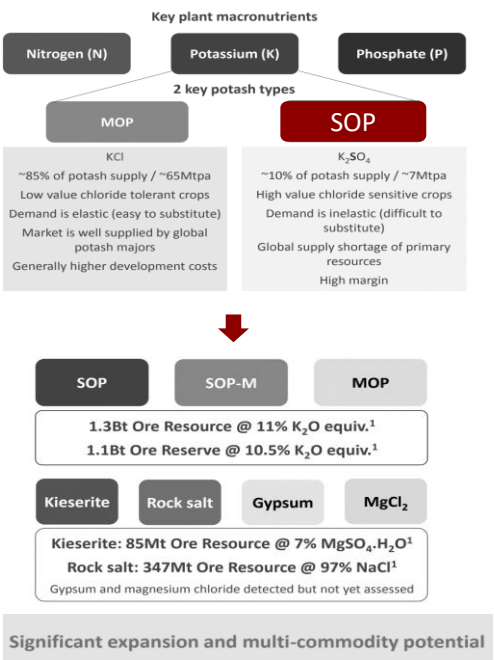
KEY FACTOR 1:
Location & Deposit Characteristics



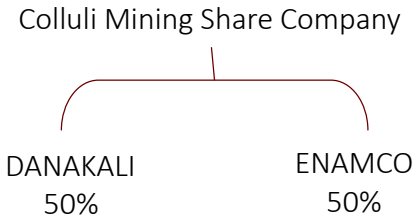
KEY FACTOR 2:
Production, costs & technology



KEY FACTOR 3:
Key plant macronutrient & multi-commodity potential



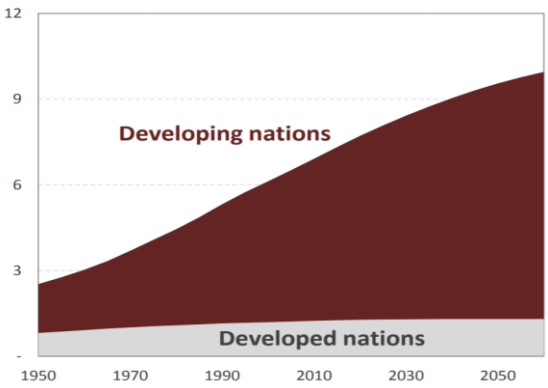
KEY FACTOR 4:
State Participation



KEY FACTOR 5:
Policies & Principles

1. Corporate Social Responsibility
2. Sustainable Development
3. Colluli as Social investor and Shared Value Solution

KEY FACTOR 6:
Strong International Demand for Fertilizers



1. Global population growth
2. Reduction in arable land
3. Changing dietary preferences
4. Under-application in developing countries

KEY FACTOR 7:
Commitment to SDGs

KEY FACTOR 8:
Partnership and Alliances

KEY FACTOR 9:
Controlled and reduced negative environmental and social impacts on Area of influence

2.3 Corporate Policies and Principles

How and in what ways Colluli will have an impact on SDGs in Eritrea will be influenced by how Colluli project operations reflect the principles, global best practice and opportunities in terms of:

A. CSR & Principles for sustainability
B. Colluli as Social Investment Company

These are going to be analysed in detail in this section. The CSR and principles are mainly analysed based on documents available in public domain from Danakali. The potential for social investment model for both the Colluli project and for the state are then discussed. As we discuss in those sections, social investment is a relatively new concept of analysing the potential impacts, externalities and linkages of a mining company.

A. Corporate Social Responsibility and Sustainability Policies

At present, Danakali Ltd (the private sector partner in Colluli) delivering the project has published a host of policies in relation to Corporate Social Responsibility and Sustainability. The principles and approach taken by Danakali are comparable to the global practice in the mining sector. Considering the company is starting the project, this should be consider as an important first step.

Under this framework, Danakali have developed a number of policies including:

- Anti corruption
- Environment
- Health and safety
- Human rights
- Risk management
- Diversity
- Continuous disclosure and
- Security Holder Communication.

Though these polices are brief statements, they are comprehensive and clarify what can be expected of the company. In addition, there are two codes: Code of conduct and code for dealing in securities.

There are also three charters governing the management:

- Board charter
- Audit and risk committee charter
- Remuneration nomination committee charter

Many of these policies and the Sustainability Framework are in line with the contents and structure of the international practice in mining industry though some aspects need further development or articulation. In table 5 below the Sustainability Framework of Danakali is identified against the five pillars of sustainable resource industry: social, economic and environmental impacts, safety and resource efficiency.

Table 5 Sustainability Framework of Danakali and 5 Pillars of Sustainable Resource Industry

Framework element	Colluli description	Reference to five pillars Sustainable Resource Industry
Vision	"To bring the Colluli project into production by adopting the principles of risk management, resource utilisation and modularity, using the starting module as a growth platform to develop the resource to its full potential."	Resource efficiency
Mission	To be a high performance company that: • "Achieves the best outcome for our shareholders • Values long-term relationships with business partners and suppliers • Supports the communities in which we opérate • Provides an enriching, fulfilling and rewarding environment for employees	Economic and social dimensions
Core values	• People • Integrity • Planet • Performance • Simplicity	Safety, social, economic, environmental, and resource efficiency

Source: Analysis developed by this study based on Danakali website and Colluli SEIA

The following areas linked to Corporate Social Responsibility and Sustainability Principles could be clarified and elaborated further:

a. Whether a specific policy regarding disabled people is needed and whether any affirmative action will be introduced especially to address the issue that mining activities tend to have fewer disabled people and fewer women in their employment.

b. Given the remoteness of the location, whether a zero accident target will be chosen and implemented. Presently, best practice in mining is moving towards this goal.

B. Colluli as Social Investor and Shared Value Solution

One of the key game changers can be to move beyond Corporate Social Responsibility (CSR) and to take the position of a social investor developing shared value. The concepts of social investing and shared value emerged mainly after the 2008 Financial Crisis and the need for firms pursuing economic growth to consider wider benefits to the society and recognising that investing in suppliers and a whole range of stakeholders ultimately creates more widely shared benefits enhancing sustainability potential of the business and all the related entities.

Hence, the shared value approach is much more than utilitarian self interest based thinking. Even without shared value approach firms can provide some benefits to their local communities such as health centres, drinking water facilities, power stations and so on. Tax benefits and warm glow effects of giving may be the main drivers in such thinking. On the other hand shared value approach makes the firms to take a very long term perspective and see its role in enhancing opportunities for all stakeholders, creation of long chain business relationships and growing the entire economy to be as important as short term financial prudence.

The analysis presented subsequently recognise that shared value in Colluli can be implemented in four possible initial channels:

Channel A: Supporting local firms- This will be done anyway as part of local procurement but under Shared Value approach Colluli can anticipate and develop local firms to position themselves to benefit from increased local economic activity such as due to up to 800 staff members on the site and the increased traffic of up to 144 trucks moving to and from the site every day.

Channel B: Identifying and developing appropriate training and skills provision for local population so that they can achieve most benefits from possible jobs that will be created in and through Colluli project. This can also be done to some extent under the CSR format but Shared Value approach means Colluli investing in the institutional capacity to train and educate the future workforce.

Channel C: Making available the fertilisers for use by farmers within Eritrea in the first instance and for farmers in wider Africa in the next step. Given that presently fertiliser consumption in Eritrea is among the lowest in the world and that there is significant scope for increasing fertiliser use by farmers in Africa, this channel can have a major positive impact. The Shared Value approach means making available such fertilisers at cost price and also helping in creating the capacity of local government and firms to become expert distributors of such fertilisers. (This is also relevant to the State's role as a social investor and discussed below.)

Channel D: By becoming a Carbon-neutral company. This is an area where both Colluli and Eritrea can become sector leaders by implementing zero Carbon approaches. These can include projects for Carbon offsetting which in turn create local employment as well health and social benefits.

All these channels have potential in Colluli but channels C and D have a particularly strong potential for making a significant impact nationally and globally. Colluli will need to plan appropriate strategies appropriate to the Eritrean context in consultation with stakeholders to take advantage of these channels.

3 Context Analysis

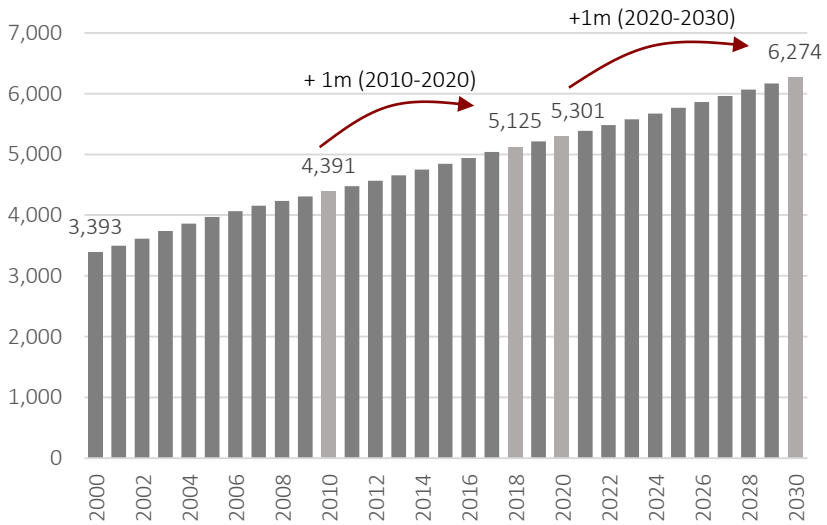
3.1 Economic and Social Conditions in Eritrea

Data on socio-economic context cannot reveal many complexities. Such data has to be interpreted in relation to historical and institutional context and development trajectory of the country in relation to geo-political and global trends.

At the dawn of its Independence in 1991, Eritrea inherited institutions and infrastructure damaged by the conflict. The young nation was included in the list of Least Developed Countries in 1994 and still remains on that list despite significant progress that has been achieved in spite of another conflict in 1998 and the subsequent situation of 'no war no peace' with Ethiopia.

In 1991, by population Eritrea was the 17th smallest in Africa and by 2011 it occupied 15th smallest in Africa. According to one set of estimates based on World Bank data, between 2010 and 2020 approximately one million people will be added to Eritrea's population and another one million people will be added by 2030 taking the projected population to 6.2 million (Figure 2).

Figure 2 Population in Eritrea



Sources:
World Bank – Development Indicators

At the time of Eritrea's Independence, the average life expectancy of an Eritrean was about 50 years and this has increased to nearly 65 years by 2015 (Table 6). While this is impressive, Eritrea is in the company of some other Sub Saharan African nations which also have significantly improved the life expectancy of their populations.

Gross primary and secondary enrolment rates are increasing but tertiary enrolment is still below 3%. Eritrea achieved health MDGs of reducing infant and maternal mortality rates by 50 per cent between 1995 and 2015. Labour force participation is quite high but productivity employment in many sectors can be quite low.

Access to water data depend on the indicator used. While the World Development Indicators data show a much smaller population provided with access to water, DHS Data from 2010 suggests a much higher proportion of population with access to water. Still a significant proportion of population depends on unimproved sources including streams, wells and tankers. Improving access to electricity, clean energy for cooking, and safe sanitation remain important issues especially for the rural population which forms 80 per cent of the national population.

Table 6 Selected indicators of socioeconomic conditions in Eritrea

Indicator	1992	1995	2000	2005	2010	2015
Population, total	3,118,582	3,090,159	3392801	3,969,007	4,39,0840	
Population ages 0-14 (% of total)	46.1	47.6	44.6	40.9	41.6	
Urban population (% of total)	16.0	16.5	17.5	18.8	20.5	
Labour force, total	1,389,422	1,336,139	1,521,754	1,858,825	2,066,409	
Life expectancy at birth, male (years)	48.8	50.5	53.4	56.7	60.1	62.5
Life expectancy at birth, total (years)	50.5	52.3	55.2	58.6	62.1	64.6
Life expectancy at birth, female (years)	52.3	54.1	57.2	60.7	64.2	66.8
Literacy rate (% of people ages 15 and above)			52.5		64.6	
School enrolment, primary (% gross)	34.0	46.7	58.7	76.2	52.9	54.0
School enrolment, secondary (% gross)		16.3	24.8	30.7	36.9	33.1
School enrolment, tertiary (% gross)		1.1	1.2		2.5	2.4
People using covered by drinking water services (% of population)			16.83	17.38	18.14	19.29
People covered by basic sanitation services (% of population)			7.55	9.01	10.42	11.26
Maternal mortality ratio (per 100,000 live births)		1018			490	
Mortality rate, infant (per 1,000 live births)	85.60	74.10	58.20	47.00	39.10	33.80
Human Development Index				0.405	0.405	0.420

World Bank: development Indicators

3.2 SDGs in Eritrea

How Eritrea can progress in terms of its 2030 Agenda and the Sustainable Development Goals is a significant challenge considering the current social and economic situation of the country, but also because of the conceptual complexity of the SDGs by themselves.

Sustainable Development Goals can be seen as global effort to shape a common global view about the future and aspirations in terms of how development should be.

Within this broader global vision, every country should build its own vision about the future in terms of sustainable development, according to its particular necessities and internal prioritization of SDGs, targets and indicators.

This task must be fully supported by friendly nations and international organizations, which could provide technical assistance for data collection, financial resources, and helping to use SDGs as a platform to find common objectives.

4 Analysis of Direct Impacts and Potential Contributions to SDG

4.1. Some Additional Considerations for the Analysis of Impact

Understanding the direct impacts and potential contributions of Colluli Potash Project to Sustainable Development Goals in Eritrea is constrained by methodological challenges beyond the traditional analysis based on the area of influence, identification of direct impacts and establishing mitigation measures. What is presented must be considered as an initial step of an ongoing effort to provide support and inform decision makers and key stakeholders in Eritrea rather than a final quantitative assessment.

Also, the analysis presented here must be interpreted considering a more extensive perspective including the political and socioeconomic context of Eritrea, its expectations and national aspirations and locally and scientifically relevant points of reference to assess the magnitude of a specific impacts.

Consequently, and aligned with the objective of this study, it is highly relevant to consider the following initial reflections:

Consideration 1. Eritrea as a Young Nation.

First of all, Eritrea is a young nation that is still building its economy, institutions and political organization, fiscal, social and economic policy design. The country won its independence just in 1991 (Ratification in 1993 under UN-supervised referendum), after armed struggle which lasted 30 years and cost the lives of approximately 65,000 Eritrean soldiers and 50,000 civilians, and for most of the subsequent decade was in a post-independence war with Ethiopia (because of tensions over the lack of an officially demarcated border) from May 1998 to June 2000 that killed between 70,000-100,000 Eritreans and Ethiopians. The subsequent situation of 'no war no peace' continued for nearly two decades until the recent historic resumption of friendship which opens a new chapter of potential co-operation that is still unfolding.

This context brings to the table a unique set of reflections to evaluate expectations and potential impacts and contributions of Colluli: what is the meaning of development and economic growth for Eritrea?; how to understand a positive or negative potential change from the perspective of the people and current social, economic, political and sustainable context in Eritrea?; and how to generate an objective analysis that can support or lead to a better scenario in terms of conditions for the sustainable development and social progress in the country?

Being a young nation is not necessarily a reason for slow progress. Other young nations have been able to achieve rapid growth and improvement in the quality of life of their citizens and this is possible for Eritrea too.

Consideration 2: The role of the state in the exploitation of non-renewable natural resources and a fair distribution of resource rent.

Clarifying and strengthening the role of state in managing the exploitation of non-renewable natural resources is absolutely crucial in achieving the intended development outcomes. In this regard, an important question is about **what is a fair distribution of the incomes and wealth generated by the exploitation of these resources.** The exploitation of natural resources (in developed and developing countries) has often been an important tool for economic growth (though some countries without natural resources also achieved successful economic growth). However its final contribution to the quality of life and social progress of the local communities is still a controversy and subject of debate in many countries and host communities of the projects.

Discussions on these questions are normally overcharged with ideological points of view, and in some contexts easily linked to regimes or groups seeking political retribution. However for the case of Eritrea, the *ex ante* decision and agreement of participation of the State of Eritrea in the joint venture of Colluli Potash Project (as owner through ENAMCO holding s stake of 50%) that will necessarily affect the future private net profit generated by Colluli, should be considered as a genuine effort of the Eritrean government (and of Danakali) to develop a mining project that can allay many concerns and pave the way for a transparent and fair resource rent distribution. (Fiscal impact section analyses these considerations)

Consideration 3: Legal frameworks, international best practices for mining development and points of reference to assess Colluli's impacts and potential contributions.

In recent years, at the global level, the resource industry has been working seriously to improve its performance and engagements with host society. Most of them have been working for better practices in terms of engagement, commitment with local development agendas, transparency, impact assessments, voluntary principles, and how to deal with global concerns including climate change, biodiversity, indigenous people or even vulnerable communities (among other important subjects and issues).

In addition, governments of resource-rich countries have been improving their legal frameworks for mining development procuring regulations that can be more balanced in terms of: incentives for economic growth; fiscal redistribution; more effective instruments for operational and environmental assessment and control; and addressing global concerns as well.

In this context, the obvious question is how these 'in progress' international best practices, improvements and new regulations could be applied to Eritrea, to Colluli and to the Eritrean mining sector in general. Based on the collected information and opinions of different local and international stakeholders, this question necessarily should be answered based on three factors and reflections:

1) Best practices, regulations for mining development should be developed, adapted and implemented as appropriate to the country context.
2) While specific regulations or international best practices are important, it is equally important to adapt and apply the 'principles' and the ideas behind the best practices.
3) It is necessary to highlight that one of the ultimate objectives of these best international regulations is (or should be) to ensure that the benefits of the exploitation of non-renewable natural resources should directly result in the human and sustainable development of present and future generations of the host country.

The present mining legal framework suggests that Eritrea is working to develop mining under a legal and best practice framework according to its own perception and its particular context. The analysis of impact assessment of this study will not evaluate specific rules or principles implemented by authorities, and will be only focused on an analysis of impacts based on the current conditions.

4.2 Overview of Colluli's impacts.

In this study direct impacts of Colluli are analysed considering five key areas.

Area 1. Economic Value Generated.

Area 2. People, Communities and Society

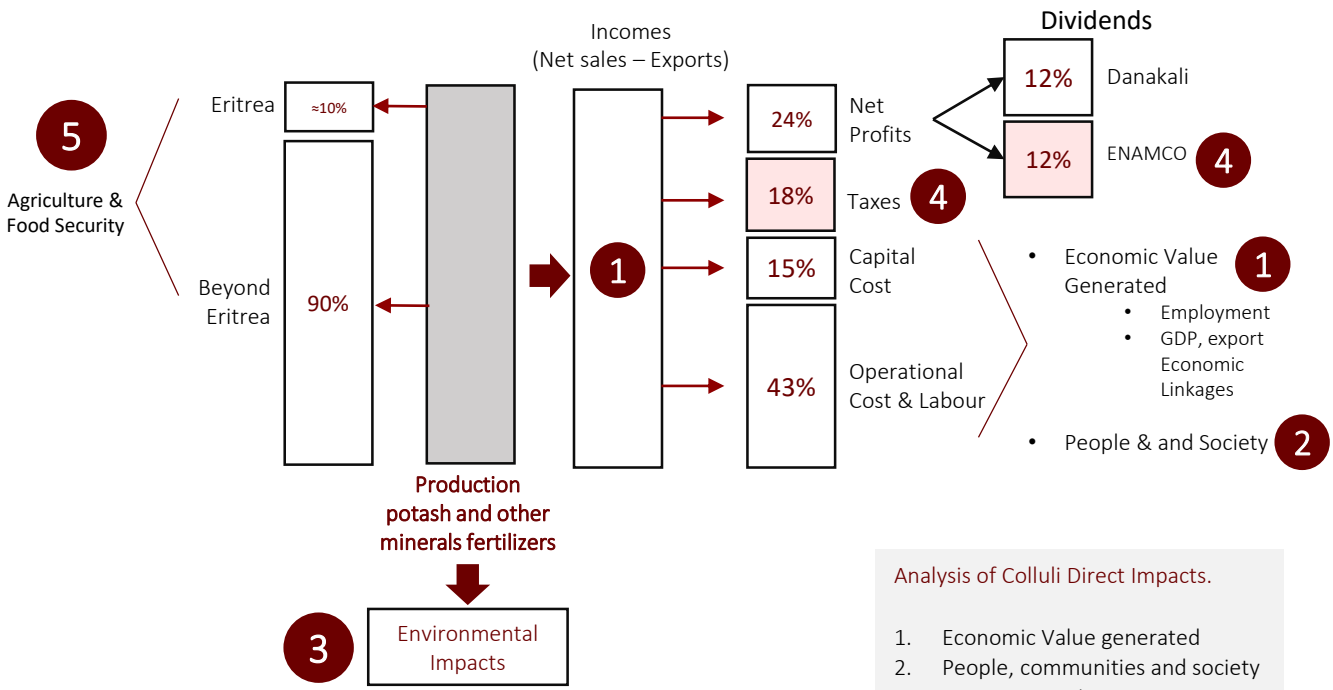
Area 3. Environment

Area 4. Fiscal Effects.

Area 5. Effects linked to Agriculture and Food Security.

Figure 3 shows an average distribution of the direct economic impacts as accumulated percentage of the total incomes of Colluli for the period 2018-2030. For example, fiscal effects considering taxes (corporate taxes and royalties) and dividends (of ENAMCO) could represent 30% of the net sales of Colluli (18% + 12%).

Figure 3 Overview of Colluli's Impacts
(Accumulated percentages of the period 2018-2030)



Source: Analysis developed by this Study

4.3 Economic Value Generated

The analysis of Economic Value Generated by Colluli in Eritrea includes an assessment of its direct economic impacts such as: macroeconomic effects, exports, capital expenditure and operational procurement, its characteristics and how these impacts are connected to the local context.

The analysis has considered standards and principles suggested by Global Reporting Initiative version 4 and the specific guidelines prepared for mining and metals (Sector Supplements - versions of the G3 and G3.1 Guidelines).

Solid Economic Cash Flow of Colluli

Colluli appears to have the capacity to generate significant economic effects. As already noted, aspects such as: the geological, technical characteristics and size of the mineral deposit; strong international demand and need for fertilizer and Colluli final products; positive business and political environment for mining development; technology of the productive process; CSR and corporate policies on sustainability; a relatively very low level of environmental concerns and no significant social negative effects identified (because of Colluli's location), make the project highly profitable with more secure economic and financial flows.

The project appears to have been designed with a conservative approach in terms of commodity prices and two basic production phases, in an effort to build a healthy long term economic and financial cash flow. This characteristic of Colluli will have extremely positive effects on financial planning and economic expectations of those decision makers, interested groups or economic agents (public institutions, households, firms, businesses or individuals) directly or indirectly linked to Colluli.

According to the estimated reserves and projected operational scenarios, Colluli could develop and continue mining activities for more than 100 years.

Table 7 Strengths of Colluli Cash Flow

	Strengths of Colluli Cash Flow
1	A conservative approach for a healthy long term economic and financial flows
2	Geological, technical characteristics and size of the mineral deposit.
3	Strong international demand and need for fertilizer and Colluli final products.
4	Positive business and political environment for mining development.
5	Affordable and well-tested technology of the productive process.
6	CSR and sustainable corporate policies already in place.
7	(Because of Colluli location) Relative very low level of environmental concerns.
8	Because of Colluli location there are no significant social negative effects identified in the operational area of influence of Colluli.

Source: Analysis developed during this study based on SEIA of Colluli, interviews and information on Danakali website.

Impact on Exports in Eritrea

Export capacity in developing countries should be understood not only as the capacity to sell products to the rest of the world, but the result of: public and foreign policies; restrictions or incentives on trade; economic efforts and synergies of local business; and the international value of local products. In this context, exports are a key element to stimulate domestic economic activity by creating employment, production and revenues, and ultimately as natural activity to technology transfer and to connect the country with international markets.

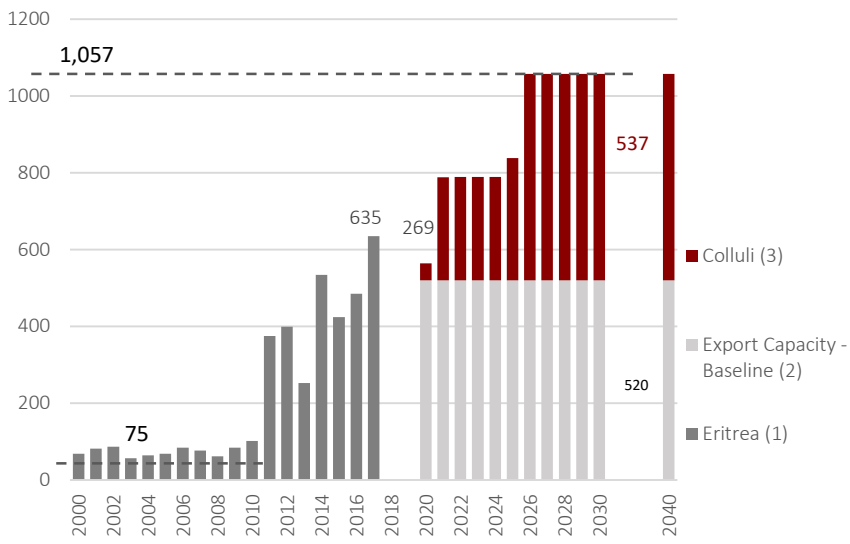
During the period 2000-2010, it is possible to observe how exports from Eritrea, despite the difficult context linked to a post-war period, remained constant in a sort of 'latency' period around US$75 million a year. However, between 2011 and 2017, because of new mining activities, exports rapidly grew to reach US$635 million a year (2017) showing a significant structural change in the composition of the exports evidencing the country's capacity to manage and sustain economic growth (Figure 4).

In this context, the potential effects of Colluli could be extremely important in terms of quantitative participation, but also because the project could be considered as an addition step in terms of mining sector consolidation.

Colluli could export US$ 269 million a year during Phase I (2020-2025) and around US$ 537 million on Phase II (2026-2030) (See Figure 4). Taking this into account, after five or six years of commercial activities, the company could account for nearly 50% of total export value of the country in a context where Eritrea could export around US$1,000 million by 2026.

Exports from the Colluli project could reach US$ 269 million a year (Phase I – 2020-2025) and around US$ 537 million by 2026-2030 (Phase II). In comparison, total exports from Eritrea could be around US$1,000 million by 2026.

Figure 4 Exports in Eritrea & Colluli Effects
US$ Million (Current)

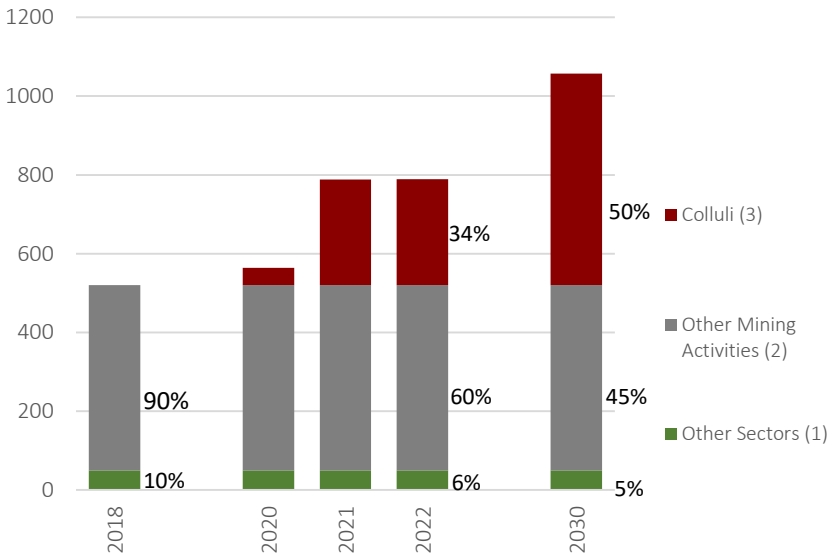


Sources:
1) Data 2000-2011: World Bank; Data 2012-2016: OEC Observatory of Economic Complexity;
2) Data 2020-2030: Study assumption based on 2014-2017 average
3) Colluli Data 2020-2030: Estimation based on Danakali

Assuming no other new mining projects would come up during the next decade in Eritrea, the contribution of Colluli to total exports could top 50 per cent by 2030. Currently (2018), mining activities represent 90% of total exports.

By 2030 mining exports in Eritrea could represent 95% of the country export capacity. (Figure 5)

Figure 5 Analysis of Eritrean Export Capacity & Colluli
US$ Million (current) and %



Sources:
1) Data 2018: Study assumption based on 2014-2017 average
2) Colluli Data 2020-2030: Estimation based on Danakali

Could Colluli produce traditional negative effects associated with export of natural resources such as: economic dependency, local inflations, or Dutch disease effects?

Despite Eritrean exports will be highly concentrated in mining and Colluli will have a significant impact on this, there is low risk of the economic issues traditionally associated to *Dutch Disease effects* considering:

- Productive factors used by mining sector and Colluli are different to productive factors used by other economic sectors (e.g. Agriculture).
- Direct employment is limited compared to employment in agriculture. This will limit labour force movements to mining.
- Mining production require a high level of standards and technology to be competitive (despite they are exporting 'raw' material). This will strengthen the industrial sector and economic structure in Eritrea, generating at the same time internal knowhow among professionals in Eritrea.
- ENAMCO (as a vehicle for state participation in the project) can play a key role in terms of technological transfer.

Traditional negative economic effects and concerns in resource-rich countries.

a. **Macro-economic Dutch Disease effects**: Mining projects have the potential to generate a huge volume of foreign exchange flows which can cause exchange rate appreciation. This can make non-mineral sectors to face unfavourable terms of trade and reduce their export competitiveness. For example, oil exporting countries find it difficult to compete in manufactured exports.

b. **Employment effects**: Compared with the share of mining sector in terms of value in GDP, its share of total employment tends to be very small. However, because mining sector is more globalised than rest of the economy, returns to human capital investment can be much greater in mining related skills and this can lead to over-investment of human capital in such skills and divert labour from other important sectors of the economy. However, this is more an issue where there is full employment and productivity in all sectors is close to the production possibility frontier.

c. **State capture issues**: In some countries, the possibility to control decisions related to mining licenses and thus the huge cash flows that will be generated from such projects makes state capture attractive. This can then institutionalise rent-seeking.

d. **Greed v Grievance issues**: Some authors argued that point based mineral resources can result in hugely skewed distribution of the benefits from such resources and create opportunities for resource based conflicts, demands for greater autonomy and resource nationalism.

These issues can be addressed through careful institutional design, putting in place long term agreements including stable tax regimes, creating a robust environment for transparency in resource sharing and integrity, pursuing industrial strategies which can help shape appropriate educational and training policies, building the capacity of local communities to understand mining projects and engage them as stakeholders throughout the operation of the project, through procurement and employment policies creating a strong local ownership for the project and so on.

Despite Eritrean exports being highly concentrated in mining and Colluli project having the potential to add significantly to these, our impressions are that the risk of economic consequences traditionally associated with *Dutch Disease effects* is low. Through careful policies and institutions this risk can be further reduced.

Impact on Gross Domestic Product

During the last 10-15 years the Gross Domestic Product (GDP) in Eritrea has risen drastically, evidencing a notorious structural transformation and the capacity of the mining sector as economic driver in the country.

For instance, by 2010 Eritrean GDP reached over US$ 2 billion. Projections (elaborated by IMF) show that Eritrean GDP could top US$6 billion by 2018 and more than US$9 billion by 2025. Probably the country will be very close to achieving GDP of US$10billion by 2030 (See Figure 7 based on current US$).

In this scenario, Colluli will make a small but significant contribution to economic growth of Eritrea. The estimations of the study show that Colluli could produce around US$470 million of GDP (after 2025 and considering direct and indirect GDP) (See Figure 8) and represent around 3% of the Eritrean GDP by 2021 (Table 8).

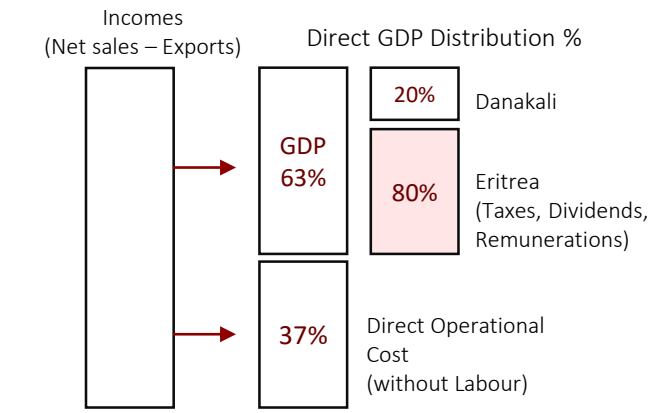
From the perspective of the potential implications for the Development Agenda of Eritrea, GDP and Economic Growth by themselves are not a measure of quality of life or sustainable development. However they are necessary ingredients to configure new and better scenarios for fiscal, economic and social planning, and policy design that can improve people opportunities and social expenditure in education, health or social protection.

Distribution of Colluli Direct GDP

At the global level, one of the main and natural concerns in relation to the value added (in this case as synonymous to GDP) generated by foreign investors in the resource sector is how this new wealth is distributed across domestic agents or which is the final impact on local productive factors.

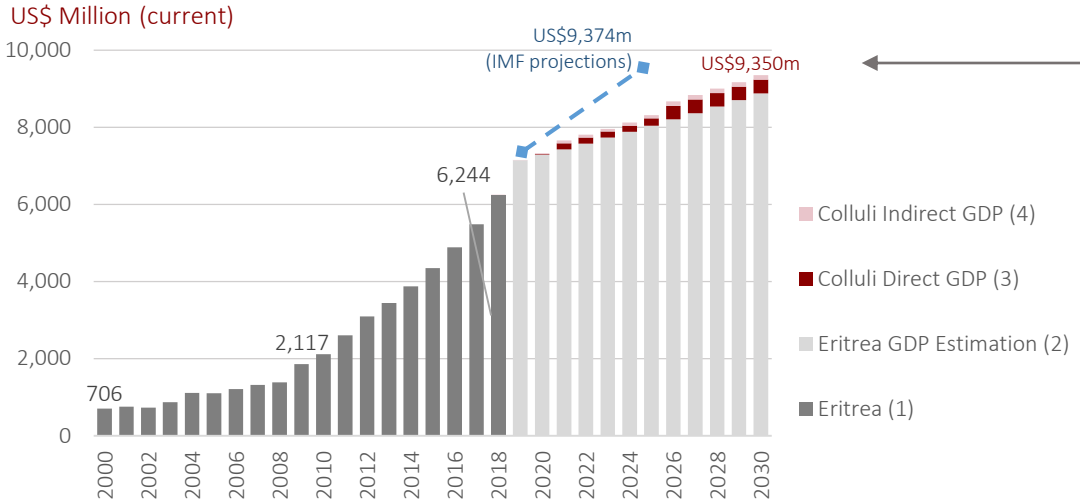
This study has estimated that 80% of direct GDP generated by Colluli will be distributed at national level through taxes, dividends and remunerations. (Figure 6)

Figure 6 Distribution of GDP Generated by Colluli Accumulated % period 2018-2030



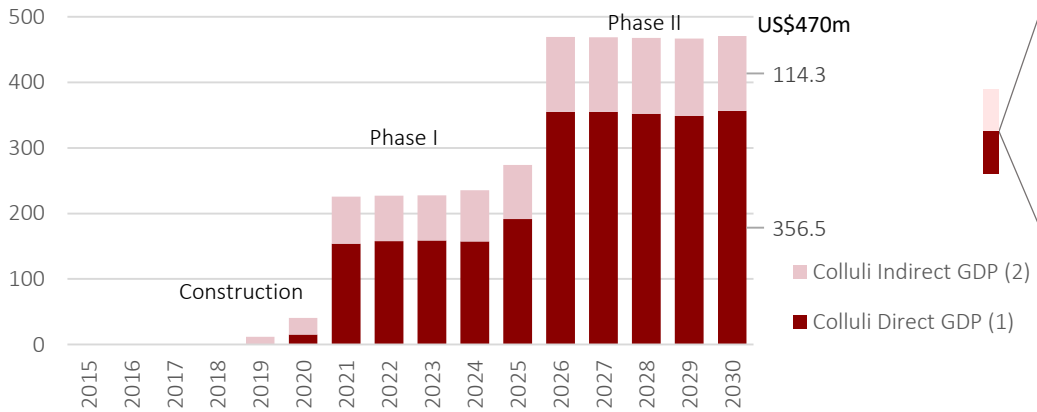
Source: Analysis developed by this Study

Figure 7 GDP Effects of Colluli in Eritrea
US$ Million (current)



Sources:
1) Data 2000-2010: World Bank
2) Data 2011-2019: African Development Bank, including estimation of IMF for the years 2017 & 2018
3) Data 2019-2030: Study assumption based on annual GDP (current) growth of 2%
4) Study estimation based on Danakali data

Figure 8 GDP Effects of Colluli in Eritrea
US$ Million current



Sources: Study estimation based on Danakali data

Table 8 GDP by Economic Activity in Eritrea and Effects of Colluli
% based on current prices GDP (1) (2)

	2010	2012	2015	2021
Agriculture, hunting , forestry and fishing	19	16.9	17.2	18.0
Mining and quarrying	2	1.7	1.8	2.0
Manufacturing	6	5.9	6.0	6.0
Construction	15	15.5	15.7	13.0
Colluli (Direct + Indirect GDP) (2)				3.0
Total Industry	23	23.2	23.5	24.0
Wholesale, trade, restaurants, hotels	19	19.4	19.2	19.0
Transport and communications	12	12.4	12.3	12.0
Public administration and other services	27	28.1	27.8	27.0
Total Services	58	60	59	58.0
GDP Total (%)	100	100	100	100.0

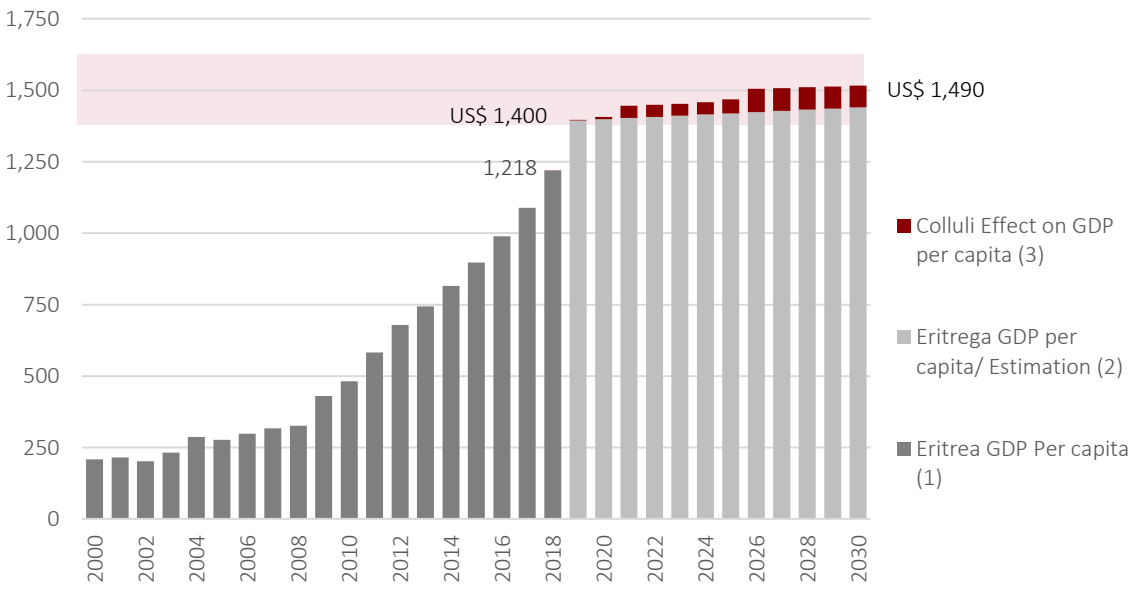
Sources:
1) Data 2010-2012-2015: African Development Bank
2) Data 2022: Study estimation based on Danakali data

Effects on GDP per capita

The economic projections for Eritrea also show positive scenarios from the perspective the GDP per capita. Between 2016-2018, the country has achieved a GDP per capita over US$1,000 a year and if the positive tendencies continue during the next years, Eritrea could reach a GDP per capita of around US$1,500 a year by 2030 (Figure 9).

Colluli's effects in terms of the GDP per capita are in the same direction as are its effects on economic growth in Eritrea.

Figure 9 GDP per capita in Eritrea
US$ (current)

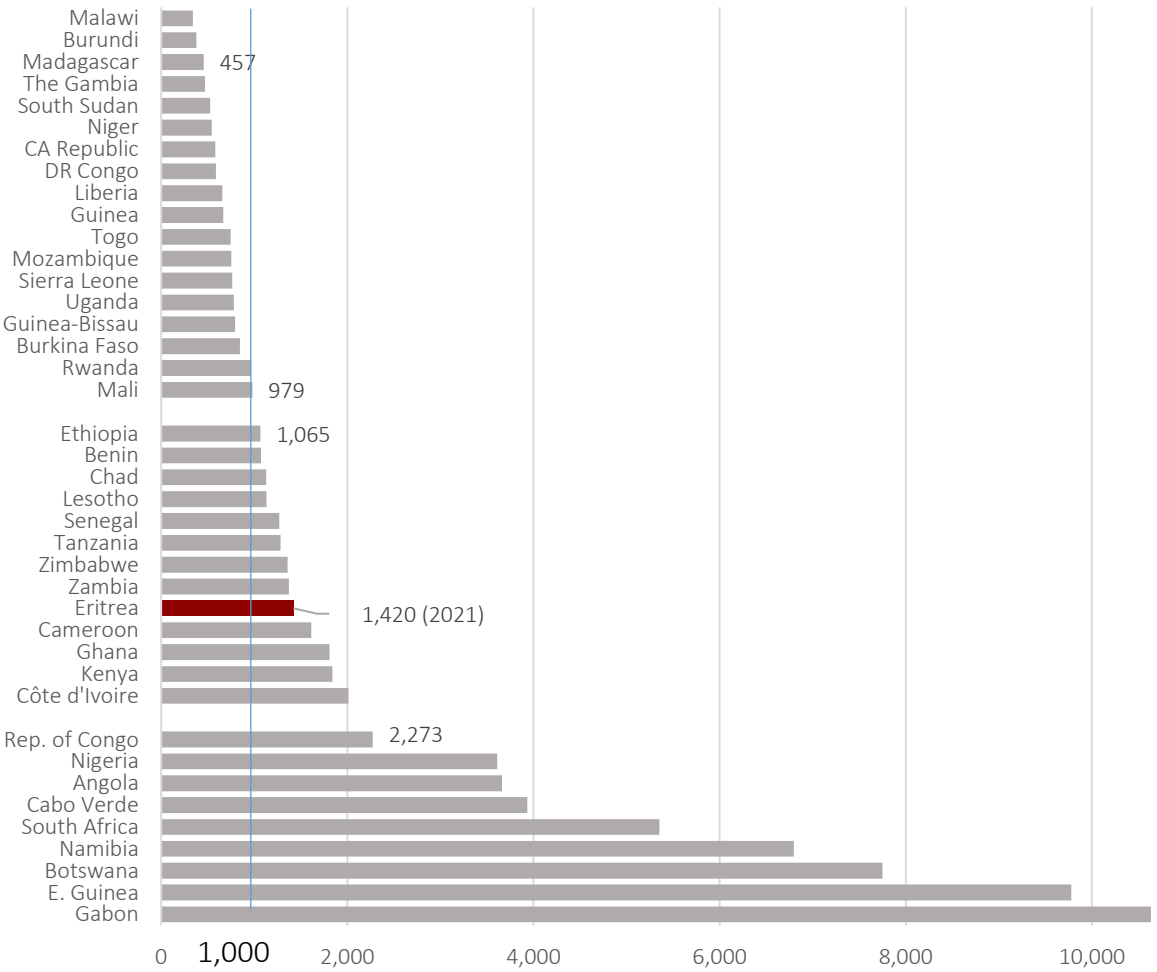


Sources:
1) Data 2000-2018: World Bank
2) Data 2019-2030: Study estimation based on: Annual GDP (current) Growth = 2% / Annual Population Growth: 1.7%
3) Colluli Effects on GDP per capita, estimated by the Study.

Economic growth in Africa continues to be a concern from different perspectives. Some 18 countries in Sub Saharan Africa have GDP per capita of less than US$1,000 (Figure 10). Economic growth is considered essential to generate resources needed for investing in the necessary public services to boost human well-being.

With the potential contribution of projects like Colluli, Eritrea could begin to move ahead of the comparator group of countries and move to the next level where economic growth makes it possible to mobilise resources to support a stronger development agenda and achievement of sustainable development goals.

Figure 10 Comparative Analysis GDP per capita in Africa (2018) and Eritrea (2021)
US$ (current)



Sources:
1) Data 2000-2018: World Bank
2) Data 2019-2030: Study estimation based on: Annual GDP (current) Growth = 2% / Annual Population Growth: 1.7%
3) Colluli Effects on GDP per capita, estimated by the Study.

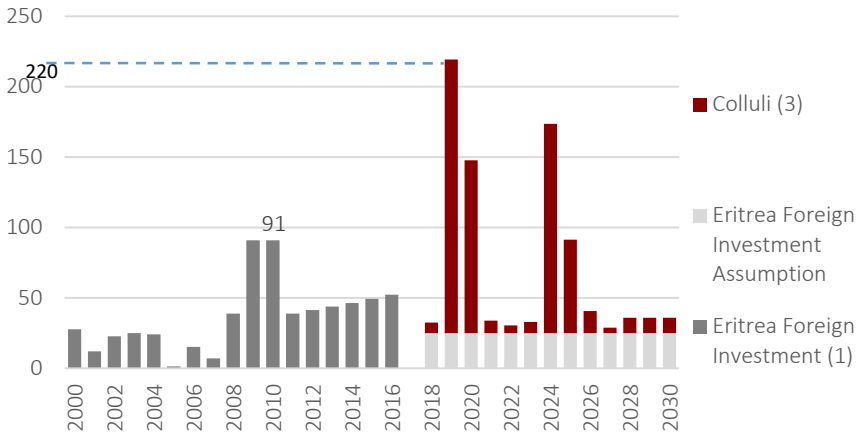
Direct Investment and National and local procurement effects of Colluli

Colluli's operational design envisages two development phases and a total capital investment of US$615 million (considering operational investment) (see Figure 11) for the period before 2030 or for the first 11 years of operational activities.

Considering cost structure and operational characteristics of Colluli, the project will generate around US$189m per year in terms of national procurement (Figure 12) (Between 80%-90% of the total operational cost of the project).

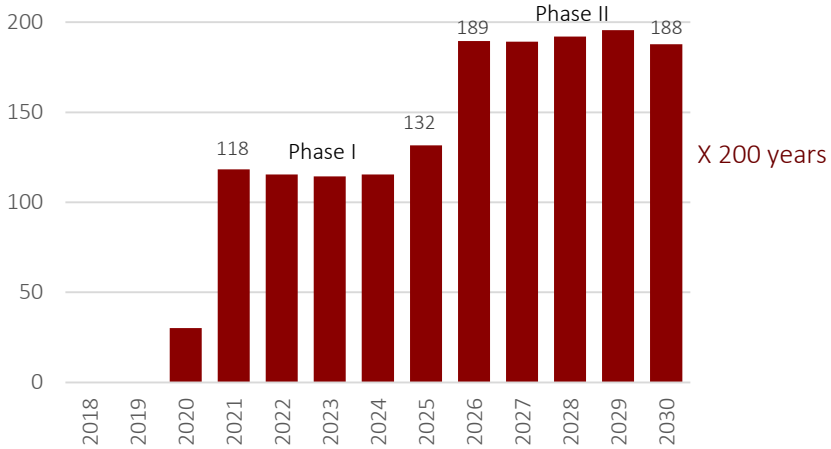
This will have a positive impact on other economic sectors in Eritrea, improving conditions for planning and local business investments, and probably positive effects in terms of market signals for other foreign investors.

Figure 11 Colluli Direct Investment & Foreign Investment in Eritrea US$ Million



Sources:
1) Data 2000-2016: World Bank
2) Data 2018-2030: Study assumption based on 2014-2017 average
3) Colluli Data 2018-2030: Estimation of Danakali

Figure 12 National and local procurement of Colluli in Eritrea (Operational and administrative costs) US$ million



Sources:
1) Data 2020-2030: estimations based on Danakali data

Industry, Innovation and Infrastructure

The operational design of Colluli has included the following productive facilities and infrastructure to support its mining activities:

i. The upgrading of Site Access Road from Marsa Fatuma to the mining site.
ii. Water Intake and Treatment unit (WITA)
iii. A pipeline to bring sea water to the mine site.
iv. Accommodation for the staff;
v. The diesel generators;
vi. Satellite communications at the mine site.

As part of the unintended beneficial effects of project related infrastructure, the potential for local economic development due to the site access road has been identified by the stakeholders and reported in the SEIA Report:

"Stakeholders along the transport corridor generally expressed high anticipation for potential business opportunities afforded by the project's use of the road (both Site Access Road and Massawa-Assab Road). The Adaito community on the Site Access Road also indicated that the upgrading of this road will also improve access to transportation facilities and facilitate travel to and from markets. The upgrading and use of the Site Access Road by the project is also expected to facilitate the establishment of improved trade and services in the area such as hotels, cafés and shops."

In addition, the project also raises opportunities for sharing of mining related infrastructure. The shared infrastructure concept is not new but has come into prominence recently. In this model, mining projects focused on bulk materials (low value to weight ratio) such as iron ore, coal, bauxite, phosphate and potash and development minerals (sands, rock salt and so on) where the transport cost can be a significant part of the FOB price of the mineral, shared use of infrastructure can help to economise on the upfront cost of infrastructure. An alternative dimension of shared infrastructure can be seen as part of social investing. In this dimension, infrastructure being built for mining can generate other benefits including to the communities. This is relevant not only for transport infrastructure but also for power plants, satellite communication services, water treatment plants and so on.

Taking water from the sea

Water for the project will be drawn from a number of sources including local saline aquifers and also the sea. A desalination plan on site will produce non-saline water. The CMSC has been granted land on the Red Sea coast at Ras Hafele for the development of a Water Intake and Treatment Area (WITA).

An 87 km long pipeline corridor connects WIT to the mine site. Two sets of HDPE pipelines will connect the WITA to the mining site – one set of pipelines to carry treated and untreated sea water for phase 1 and the second set for the increased production during the phase 2 operations. For most of this length, the pipelines will be buried under ground.

There will be a Reverse Osmosis desalination plant at WITA. This will reduce total dissolved salts (TDS) per litre from 38,000 mg to about 500 mg. The waste brine will have much higher salt level of about 63,000 mg per litre and discharged into the sea. RO plant in phase 1 will have a throughput of 263 cubic metres per hour which will be increased to 526 cubic metres per hour in the second phase.

Economic Growth and Poverty reduction in Eritrea.

Data on poverty (as defined by international poverty line) are difficult to come by, however it is absolutely relevant for this study to analyse the current and past relationship between this indicator and the economic growth in the Country.

Hence, between 2000 and 2009, macro-level data suggests that GDP growth and poverty reduction in Eritrea could have had a positive correlation: If GDP grow, the Poverty will decrease (Figure 13).

However, data of the period 2009-2016 does not appear showing the continuation of this trend. Thus, while the GDP grew from US$1.8billion (2009) to US$4.8billion a year in 2016, poverty remained at a similar level of 17% -18% of the total population in Eritrea.

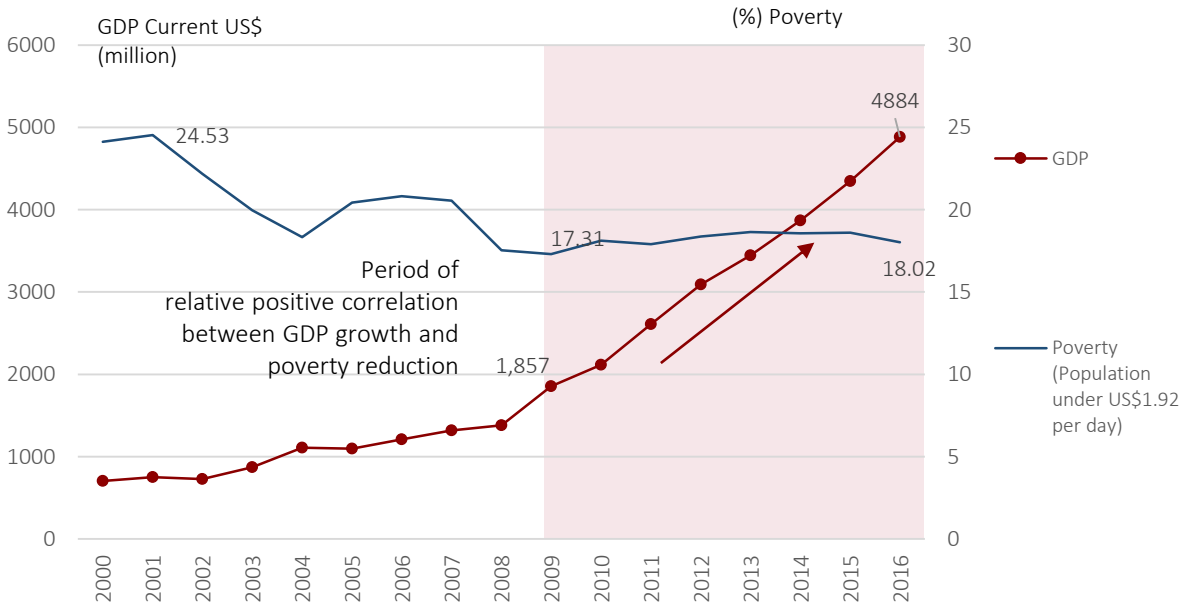
This is a fundamental consideration for this study that brings the following questions in the context of the potential contribution of Colluli to SDGs: **Can the potential economic growth of Colluli (by itself) support better socioeconomic conditions in the country?, or Can Colluli's economic impact play a relative more important role in terms of poverty reduction in Eritrea and specifically in terms of contribution to SDG 1?**

The analysis proposes that economic growth generated by Colluli could not be immediately translated into poverty reduction, and it will be necessary to have a 'waiting period' to observe poverty reduction by direct economic effects linked to Colluli.

'Poverty' represents human conditions, and its analysis should be based on multi-dimensional approaches, and an income based approach by itself does not fully capture the situation.

In addition, it is possible that other factors like the international sanctions imposed to Eritrea post-2009 (UN Security Council Resolution 1907) may have had a more important effect in terms of restricting opportunities for socioeconomic progress. Thus, even as nominal GDP has increased in Eritrea, it is possible that sanctions imposed significant negative terms of trade acting in effect like a tax imposing extra costs on the economy and consequently on social conditions.

Figure 13 Poverty and GDP in Eritrea



Source:
1) World Bank – Development Indicators

Colluli, Economic Growth and poverty reduction.

In this section, an attempt is made to analyse the past trend of poverty reduction in Eritrea and how that has been correlated with the GDP and how the future economic growth is likely to result in SDG impacts with and without specific policies.

Colluli can have impact on poverty at local, regional and national scales. The local impacts will be through: (i) procurement and employment of local persons in construction and operations; (ii) CSR and social impact investments (such as through water supply, electricity, transport) that will benefit the local communities. The regional impacts on poverty are through further downstream employment created at the port of Massawa and transport related jobs in logistics and also along the road corridor.

The national impacts are more indirect and they are mainly due to the increased GDP of the country which in turn can lead to further demand for various goods and services and thus create employment. It is pertinent to quote Rodrik (2007) who noted: "Historically nothing has worked better than economic growth in enabling societies to improve the life chances of their members, including those at the very bottom."

Impact can be estimated by comparing impact on poverty due to GDP without Colluli and with Colluli project. To estimate this, first we need to examine the trend so far. Data from 2000 to 2016 indicates that poverty decreases as GDP increases. Data on income poverty is limited but from the SDG indicators, we have data on poverty among 15-24 year olds and those of age 25 and above. (Figure 14)

As can be expected, the relationship is not very strong and it is possible to make projections with moderate confidence. Intuitively, it is known that GDP is like increasing the size of the cake, however GDP does not translate into poverty reduction unless there are strong distributive policies or long term growth. In the absence of alternative data, these projections can be used as a broad and indicative assessment of future poverty impact of GDP as a tool of policy analysis.

By itself, the impact on poverty of additional GDP and increased government revenue is small. However, if the future economic growth becomes mildly, moderately or strongly pro-poor then the impact in reducing poverty can be significant. This is shown in Figure 15.

The illustration in Figure 15 suggests that without Colluli, based on current trend, poverty among the working age population of 25 years and above may decrease to 14.04 per cent by 2030 and with Colluli due to its macro-effect poverty in this group may decrease to 13.9 per cent.

With mildly pro-poor growth, poverty can decrease to 12.75 per cent; with moderately pro-poor growth policies, poverty may decrease to 11.65 per cent and with strong pro-poor growth policies poverty can decrease further to 8.16 per cent. Though there are limitations to this estimation method, the scenarios highlight the need for and importance of a state directed pro-poor policies to leverage the growth boost from Colluli. Pro-poor policies can include the following:

a. Targeted cash transfer or fertiliser subsidy programmes for the poor households.
b. Capacity building to boost the skills of working age population to increase their productivity;
c. Institutional support for national and local government for better information and monitoring.
d. Improved labour market policies including better information, matching of skills and with market demand, providing social support for seasonal variations, and gender based policies to support women into work especially after child bearing and caring.
e. Strengthening rural extension services to include both agricultural and non-agricultural activities.
f. Promoting urban and informal innovation through financial mechanisms including start up loans.

Figure 14 GDP and Poverty in Eritrea 2000-2016

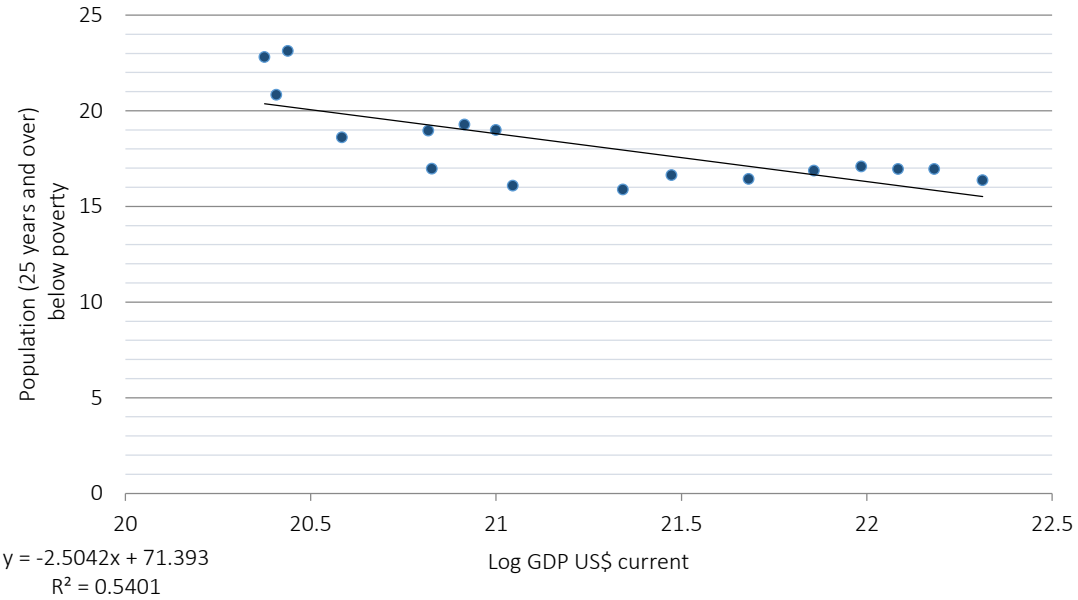
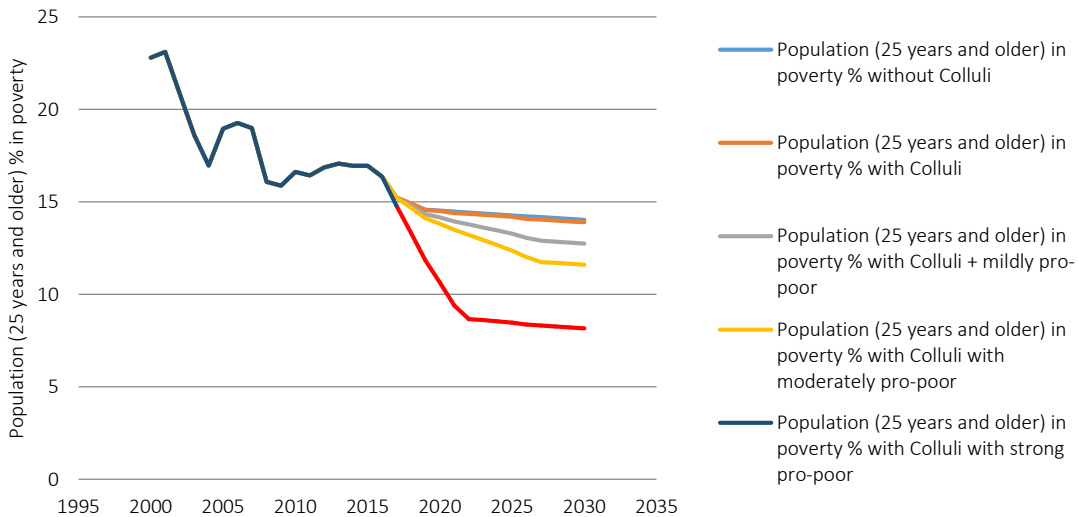


Figure 15 Poverty Projections based on Colluli effects and Different Pro-Poor Policies



Economic Value Generated and Potential Contribution on SDGs

The expected economic value generated by Colluli through exports, impacts on GDP, GDP per capita, local procurement, investment and industrialization will probably produce a better scenario for sustainable development. Because of that, it is also expected that Colluli could make a significant contribution to the sustainable development agenda of Eritrea.

This study has identified clear connections with four specific SDGs (and some of their targets): SDGs 8, 9, 16 and 17. In addition some potential synergies, however further interventions and activities are necessarily required.

Table 9 Colluli Potential Contribution to SDGs through Economic Value Generated

SDGs		Economic Value Generated
1	No Poverty	NS
2	Zero Hunger	
3	Good Health and Well-Being for people	
4	Quality Education	NS
5	Gender Equality	
6	Clean Water and Sanitation	
7	Affordable and Clean Energy	
8	Sustainable Economic Growth & Decent Work	HP
9	Industry, Innovation and Infrastructure	HP
10	Reduced Inequalities	
11	Sustainable Cities and Communities	
12	Responsible Consumption and Production	
13	Climate Action	
14	Life Below Water	
15	Life on Land	
16	Peace, Justice and Strong Institutions	HP
17	Partnerships for the Goals	HP

HP : High Potential:
Direct impacts of Colluli have high potential to make a positive and significant contribution to SDGs.
NS : Natural Synergies:
Direct Impacts of Colluli have natural synergies with SDGs, however further actions are needed

4.4 People & Society

One of the most important contributions of a mining activity is its potential effect in terms of employment, and not only in terms of the creation of direct new placements, but in terms of policies, quality of new jobs, and the subsequent indirect employment effects.

The people are the ultimate beneficiaries, and not only through remuneration and compensations for their services, but because of they are the final depositories of new information, technology, skills and capacities to produce new virtuous economic cycle.

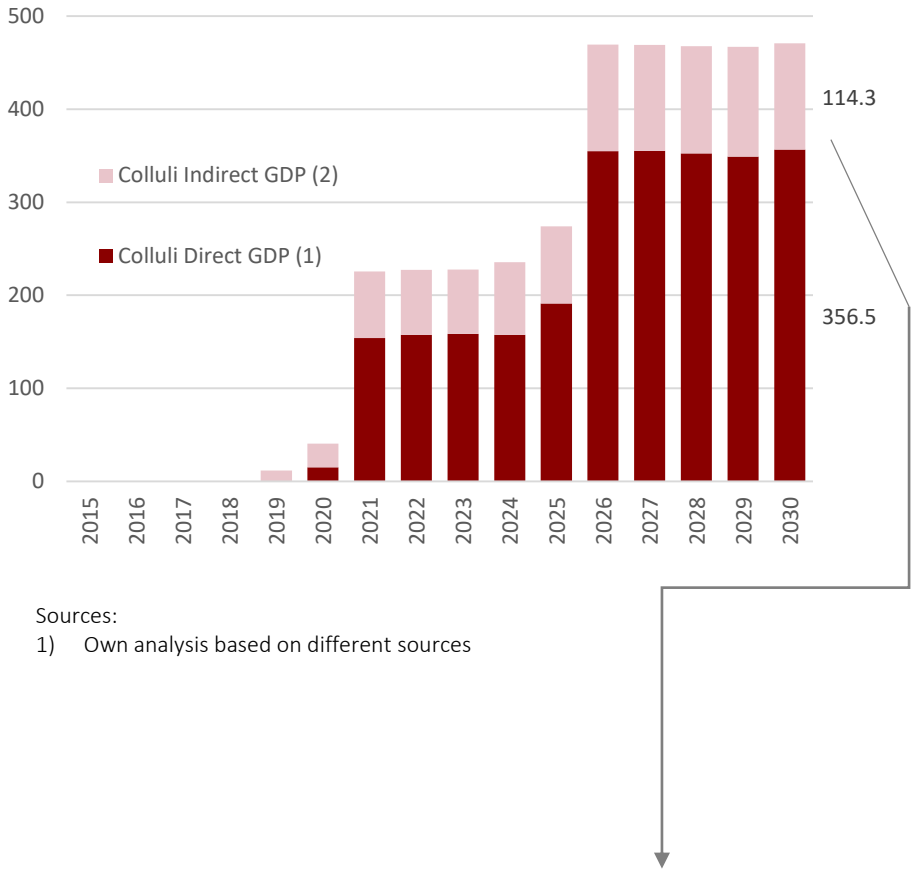
Colluli's operational design has considered to create 400 new employment positions (Colluli's employees). However, because of its investments and operational expenditure, it is expected important economic linkages with the rest of the economy that will connect Colluli with at least 10,000 people (labour force) of other sectors by 2021 or after the third year of operational activities (Figure 16 and 17).

The study has estimated the indirect connections of Colluli with the labour force of other sectors in Eritrea using conservative assumptions about labour force productivity and population growth. These 10,000 employees must be understood as the Eritrean labour force that will be connected with the indirect GDP generated by Colluli (and not necessarily new employment). Some economic activities in Eritrea will require using existing employees, however others economic activities will necessarily hire or create new employees according with their own level of productivity.

Indirect GDP generated by Colluli needs to employ local labour force. Some activities will require using existing workers and others will necessarily create new job placements.

Some of the employment linked to Indirect GDP of Colluli should have better levels of productivity than other economic sectors of Eritrea.

Figure 16 Direct and Indirect GDP of Colluli



Sources:
1) Own analysis based on different sources

Figure 17 Employment Linked to Direct and Indirect GDP of Colluli

Sources:
1) Own analysis based on different sources

Labour Force Connected to Colluli in the context of Eritrea.

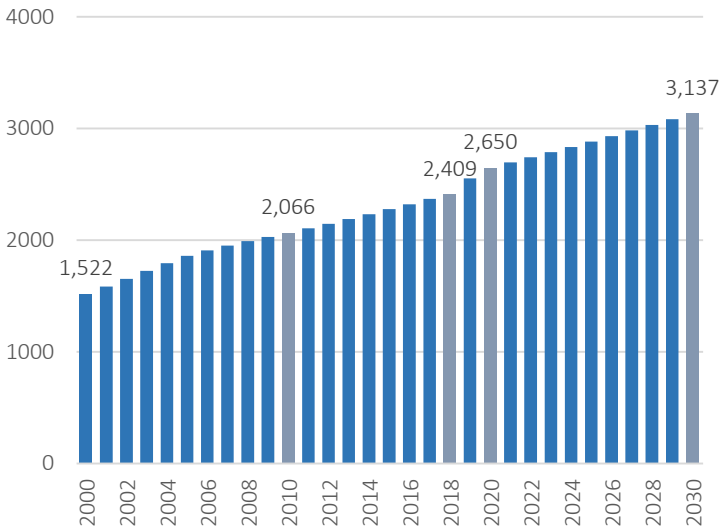
Labour Force in Eritrea is estimated at 2.4 million of people (2017) and probably will grow to 3.1 million by 2030. Then, the economy need to generate at least another 700 thousand of new work placements during the next 15 years (Figure 20).

This is an important pressure in terms of job creation for the economy and for policy makers that will need to carefully work to address key aspects such as creation of incentives for new investments and business, productivity issues and labour conditions.

Productivity of the occupied labour force in Eritrea could be around US$2,700 –US$3,000 a year per person and there is no sign of improvement during the next 10 or 15 years (based on current GDP and population projections - Figure 22 & 23).

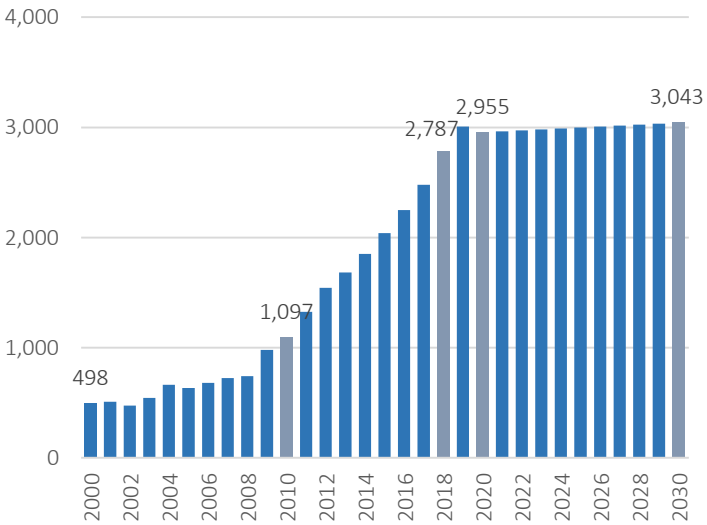
In this context, Colluli will not have an obvious effect in term of employment creation (around 0.5%-0.3% of the total labour force in Eritrea), however the potential qualitative effects on quality of the employment in terms of productivity or formality could be significant for the local workforce connected to Colluli.

Figure 20 Labour Force in Eritrea
Thousand of People



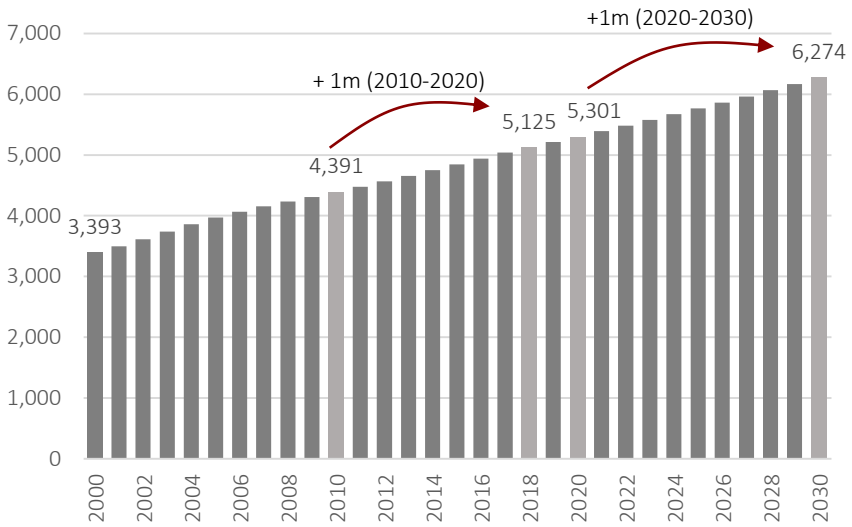
Sources:
1) % of Labour Force and % of Occupied: ILO
2) Projections 2018-2030 based on % Labour Force = 50% of total population and 7% of Unemployment

Figure 21 Productivity of Labour Force (Occupied) in Eritrea
GDP/ Occupied (US$ current)



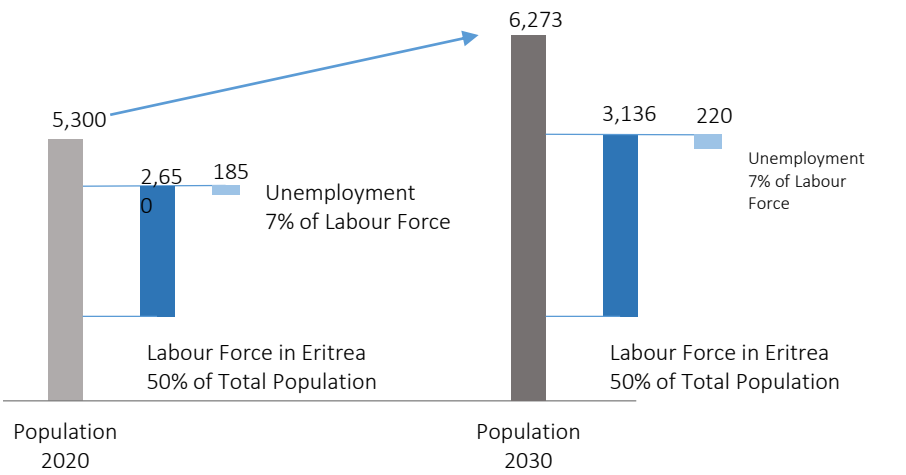
Sources:
1) Own analysis based on different sources

Figure 22 Population in Eritrea



Sources:
1) World Bank – Development Indicators

Figure 23 Population and Labour Force in Eritrea
Estimation 2020 and 2030 (Thousand of People)



Sources:
1) % of Labour Force and % of Occupied: ILO
2) Projections 2018-2030 based on % Labour Force = 50% of total population and 7% of Unemployment

Potential Contribution on SDGs

Colluli could help Eritrea to achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors.

Because of Colluli's corporate policies, it is expected the company can support direct job creation in those sectors directly linked to its operational expenditure and investments (Indirect GDP) and in general, productive activities,, entrepreneurship, creativity and innovation, and encourage decent job creation, formalization and growth of micro, small and medium-sized enterprises.

Hence it is predictable a positive contribution on SDGs 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Table 10 Potential Contribution to SDGs through People and Society

SDGs		People & Society
1	No Poverty	NS
2	Zero Hunger	
3	Good Health and Well-Being for people	NS
4	Quality Education	NS
5	Gender Equality	NS
6	Clean Water and Sanitation	
7	Affordable and Clean Energy	
8	Sustainable Economic Growth & Decent Work	HP
9	Industry, Innovation and Infrastructure	
10	Reduced Inequalities	
11	Sustainable Cities and Communities	
12	Responsible Consumption and Production	
13	Climate Action	
14	Life Below Water	
15	Life on Land	
16	Peace, Justice and Strong Institutions	
17	Partnerships for the Goals	

HP : High Potential:
Direct impacts of Colluli have high potential to make a positive and significant contribution to SDGs.
NS : Natural Synergies:
Direct Impacts of Colluli have natural synergies with SDGs, however further actions are needed

4.5 Environment

Analysis of Social and Environmental impact Assessment Study

The Social and Environmental Impact Assessment (SEIA) report of Danakali noted that: "The project location in the remote Danakil Depression means that adverse environmental and social impacts will be low in number and largely be of low risk in nature. This is a direct result of the majority of land disturbance required for development of the project occurring within areas identified by baseline studies as being largely barren land and the majority of project activities occurring more than 20 km from the nearest residential areas." Notwithstanding this remoteness of location, the project will have a number of important impacts both during the construction and operations phases.

These include the following:

Table 11 Colluli Environmental Impacts

	At the project site	Wider impacts
During construction phase	Air pollution caused by heavy equipment Impacts due to water extraction and use Removal of overburden and waste rock Unanticipated events	Impacts due to construction of the approach road Impacts from traffic to and from the project site (Air pollution, noise, disruption to migratory paths of wild animals and other species, potential impact on cultural sites)
During operations	Air pollution Water extraction and pollution issues including disposal of brine Vehicle operations at the site Other social and environmental issues arising from the project staff	Air pollution and noise from traffic Possibilities for accidents Negative and unintended consequences of project traffic (ribbon development, social impacts, health impacts and risks to cultural assets)
Closure	Return of the land to 'original' state or 'state fit for other downstream uses' Removal of future hazards	Restoration of long term environmental changes

Based on Danakali SEIA

SEIA: Summary of Environmental Impacts

There were no systematic studies of the project location prior to the baseline studies conducted for the SEIA of the project. The SEIA report is based on in depth studies following the IFC Performance Standards Framework for such studies. IFC framework includes eight performance areas:

a. Environmental and social risk assessment and management;
b. Labour and working conditions;
c. Pollution prevention and resource efficiency;
d. Community health, safety and security;
e. Land acquiring and involuntary resettlement;
f. Conservation of biological diversity and sustainable management of natural resources;
g. Protection of the rights and well-being of indigenous people;
h. Protection and conservation of cultural heritage.
i. The SEIA report systematically examines baseline conditions and makes prognosis of impacts during the construction, operation and closure phases of the Colluli Mining project.

Water Impacts

Water is a precious resource in the project location and surrounding region. The report notes in chapter 7 various predicted environmental risks to water resources in the project area. Eleven risks are analysed for the mine site area and all of them are considered low or medium. Five risks are considered at the Water Intake location (WITA) and all of them are rated low. Six risks were considered in relation to the water pipeline but 5 of them are rated low and only one is rated medium (the risk of disturbance of watercourse banks leading to instability". Ten risks are assessed along the Site Access road and nine of them were rated low and only one as medium (contamination of water dams/tanks along the Site Access Road). Six risks were considered for the Public Road (between Massawa and Fatuma Marsa) but only one is considered to be high risk (disturbance of bed and banks of waterways as a result of road crossings causes increased instability and results in reduced water quality – sediment load). The mitigation plan includes a number of preventive measures.

The report notes that among the 15 villages closest to the project area: four villages have hand dug well and one had a shallow well. In these water is accessed by rope and bucket. Another three villages have a bore hole, one of them being motorised, one with solar panel and inverter and one with a hand pump. There is also one village which has a borehole but sometimes water is also trucked from Gelato when the borehole is not working. In the remaining six villages there is no source and water is trucked from distant sources.

The SEIA report notes that the groundwater in the mine area is "…hypersaline and has no ecological or human end-users and no abstraction is planned outside of the Mine Site area." Various inherent and residual risks to hydrogeology and possibility for groundwater to be contaminated were considered. Most of these risks were rated either as low or medium. Groundwater Management and Monitoring Plan includes many mitigation measures to minimise the impacts.

Air impacts

The SEIA report notes no significant air emissions in the baseline and that the only significant emissions at the project site are related to the combustion of diesel (due to mine fleet) and heavy fuel oil (for power generation). The report notes that fugitive emissions from the vehicles coming to and leaving the mine site will generate emissions along the Site Access Road. According to the project design, there will be three trucks per hour leaving the site. If we assume that three trucks also will have to travel in the opposite direction after Potash has been offloaded in the marine vessel at Massawa Port, this makes 6 trucks per hour or 144 trucks per day but spread over a distance of 230 km by road. The first 50 km of this road is sealed but the rest of the road is unsealed (at present). The SEIA report identifies as high or extreme inherent risk of "…Particulate emissions due to traffic movement along unsealed road causes chronic impacts to people (physical and mental health and amenity)".

It is expected that most of the project staff will be recruited nationally or internationally than from within the neighbouring region of the Zoba. In many mining sites, staff stay on site for up to two weeks and then travel home or to the capital city for the rest period. Over the life of the mine particularly in the early years, this could generate a weekly traffic from the mine site to Asmara. Whether the emissions from this added traffic are included in the emission estimation is not clear.

The SEIA also highlights that the baseline condition of PM10 and PM2.5 particulate matter dust pollution is already high in the mine site area and that these exceed WHO guidelines in any given 24 hour period. The additional dust fall due to the project construction and operations including by traffic generated is considered to be within the range of natural variation.

Greenhouse gas emissions

The SEIA report estimated that annually 12.4 ML of diesel and 22.6 ML of heavy oil will be consumed during operations. Based on this the report estimated that 95.3 kilo tonnes (kt) of CO2 equivalent greenhouse gases will be released per annum. The report notes that this will form 3 per ent of the 2010 reported Eritrean total of 3,792 kilo tonnes. The report does not give details of whether the estimate of 95.3 includes also the emissions from trucks that have to make the return trip from Massawa to the Colluli project site.

Biodiversity impacts

The risk assessment report identifies the potential risk of the various project components to habitat and wildlife under the following aspects:

- "Fragmentation of habitat due to land disturbance
- Injury or death of fauna due to interaction with construction vehicles/equipment
- Injury or death of fauna due to interaction with mining equipment
- Injury or death of fauna due to bogging in process and tailings ponds
- Injury or death of fauna due to drowning in salt water storage ponds
- Disruption of wildlife migration patterns through rangeland
- Increase in feral fauna populations resulting from attraction to food wastes and water
- Disruption to use of Galli Colluli Oasis by wildlife
- Aggregate borrow pit provide additional water resources attracting wildlife and feral fauna to mine area."

The only item at the mine site attracting a medium risk categorisation is that of the risk of "disruption to use of Galli Colluli Oasis by wildlife". All other categories were given low risk rating. The risk assessment also identifies as extreme the risk of injury or death to livestock "…due to [livestock] traffic interaction with transport vehicles".

Cultural impacts

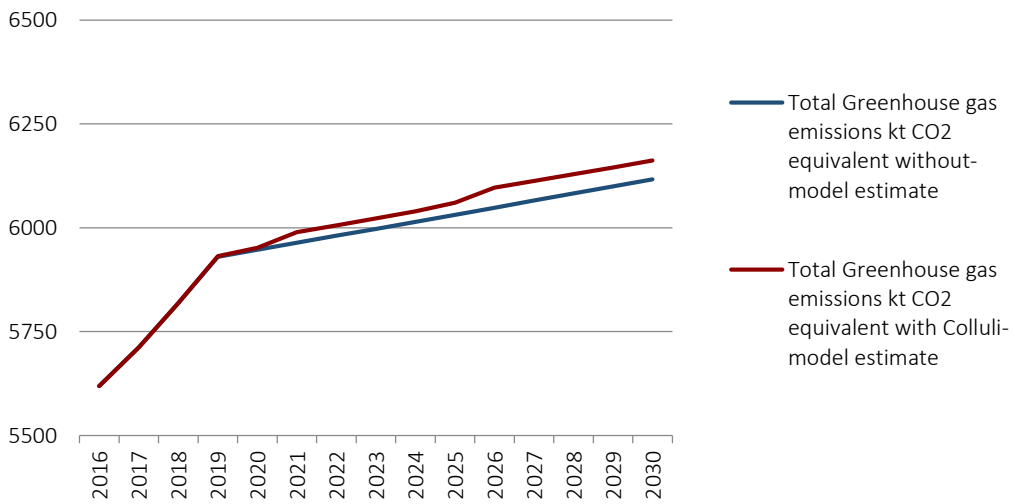
The report notes two main cultural impacts, one the risk or danger of ancient graveyards being disturbed by the proposed pipeline from Water Intake and Treatment unit (WITA) to the Mine Site and the second regarding the impact of traffic generated by the project and the number of people from outside the area coming into the location. The socio-economic survey identifies that the majority of people in the region are of Afar ethnicity and that they are concerned about the potential impact of the project on their way of life.

Climate Change

Eritrea has been a signatory to the Framework Convention on Climate Change. Though Eritrea's total greenhouse gas emissions form less than 0.01 per cent of World emissions, the first National Adaptation and Mitigation Action Plan of 2007 noted that a doubling of CO2 levels can lead to an increase in average temperature of 4.1 degrees Celsius and variation in rainfall of between 0.1 to 0.15 inches. The report noted that: "…Such long term changes in climate will have serious adverse impacts on agriculture, water resources, forestry, coastal environments, and human health. Moreover, impacts are already being observed in each of these sectors." Total greenhouse gas emissions increased from around 3,688 kt at the time of Independence in 1992 to around 5,000 kt in 2012. However, since 2007, even while economy has been growing the total greenhouse gas emissions stayed more or less at the same level. When seen in real terms (constant prices) the CO2 emissions per dollar of GDP have been coming down.

Based on long term trend, the total greenhouse gas emissions may continue to increase to 2030 and the model estimation which is likely to be slightly on the higher side puts total emissions at 6,117 kt without Colluli project and 6,162 kt with Colluli project and associated impact on GDP an increment of about 30 kt during the early years of the project until 2025 and 45 kt per annum thereafter.

Figure 22 Total Green House emission



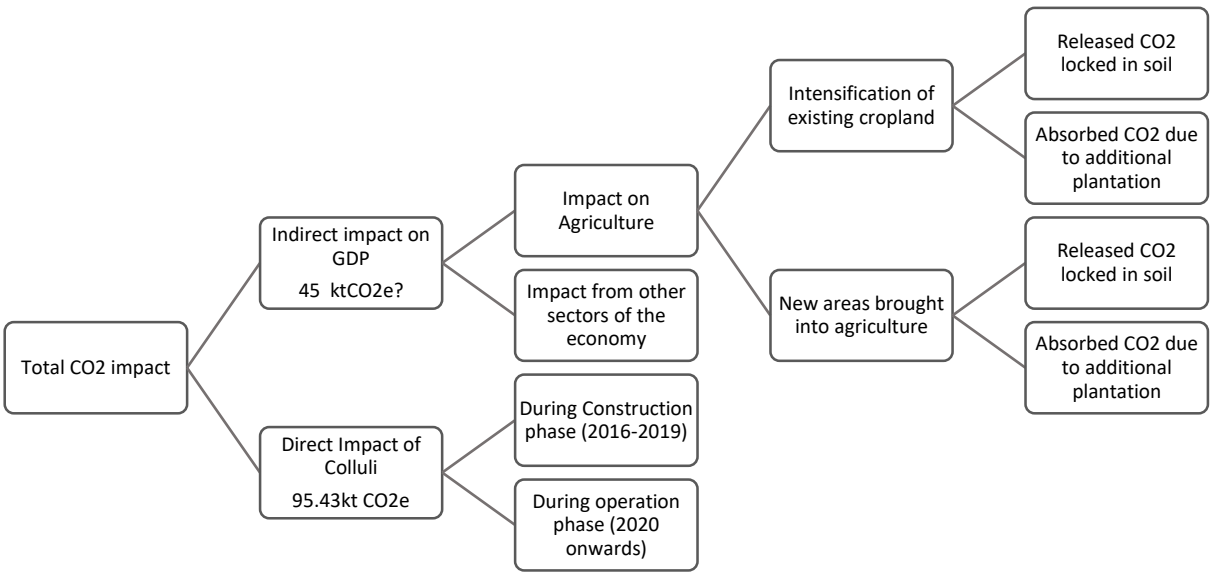
Source: Analysis developed by this study

Scenarios of Colluli becoming Carbon neutral

The SEIA document notes the direct impact of Colluli project will be equivalent to 95.43 kt of CO2 equivalent. This does not take into account downstream intensification of agriculture and related impacts. We can estimate this following the thematic approach shown in the figure below. Agricultural activity can result in releasing CO2 locked in the soil and itself can have resulting emissions due to energy use but a small amount of CO2 sequestration takes place as the crops grow. CO2 emissions depend on the nature of the crop. Therefore, it is really difficult to estimate the final total impact but the final impact of Colluli can be in a range between 140 to 210 kt per annum.

To make this Carbon-neutral, various alternative strategies can be pursued such as offsetting Carbon through forestry or by reducing emissions elsewhere in the economy through investments in clean technologies. It is again very difficult to estimate how much forest needs to be grown to absorb one tonne of CO2 because it depends on the nature of the trees, the density of plantation and the nature and extent of CO2 locked in the soil. While conifer forests can absorb 14 tonnes of CO2 per hectare, woodlands elsewhere are estimated to absorb 5.4 tonnes of CO2 per hectare. Taking a lower figure of about 5 tonnes per hectare, it can be estimated that some 28,000 to 47,000 hectares of land would need to be converted to forestry annually to make Colluli and associated direct and indirect impacts to be Carbon neutral. This is equivalent to increasing Eritrea's forest area by approximately 2 per cent per annum.

Figure 23 Colluli CO2 – Conceptual Model

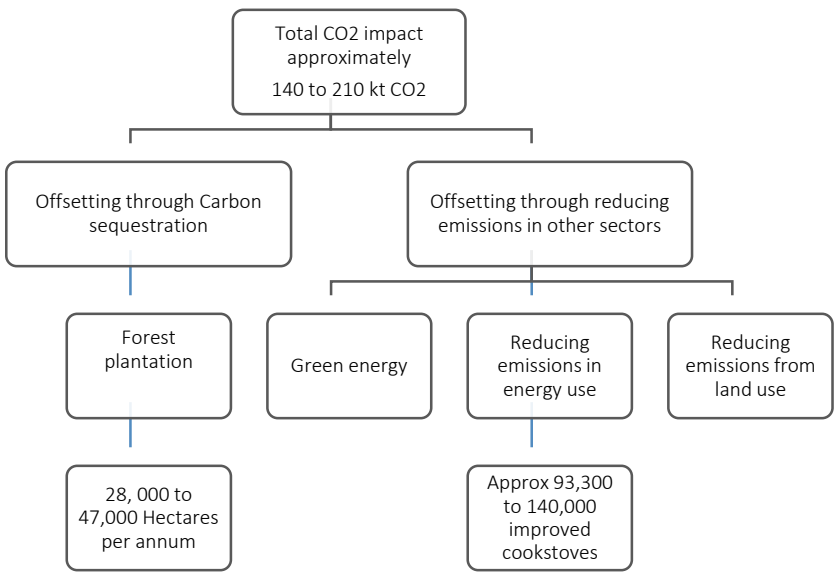


Source: Analysis developed by this study

An alternative illustration is given of the improved cookstove programme. Nearly 80 per cent of households do not have access to clean fuel for cooking purposes. Wilson et al (2016) estimated the avoided CO2 emissions in Sudan by switching from traditional three stone open wood burning stove to an improved cookstove over the (five year) life cycle of the stove results in a saving of 7.5 tonnes. Using this as a benchmark, providing improved cookstoves to some 93,000 to 140,000 households annually will result in making Colluli project carbon neutral. This programme over ten years will exhaust all the households currently without access to clean fuel for cooking.

Another aspect relates to investing in improved water points for drinking water supply especially to rural communities. Such rural water projects can help promote water conservation, green cover and improved access to biomass and fodder for livestock in addition to reducing CO2 due to deforestation due to additional fuel costs of pumping and transporting water from distant locations.

Figure 24 Colluli CO2 – Conceptual Model



Source: Analysis developed by this study

Potential Contribution to SDGs

Considering the analysis of environmental effect of Colluli, it is possible to visualize potential contributions in terms of Goal 13: Take urgent action to combat climate change and its impacts.

Colluli environmental policies and future actions in terms CO2 emission and climate change could support the integration of climate change measures into national policies, strategies and planning. In addition, to create reinforce policies and institutional capacities for climate change mitigation.

Table 12 Colluli Potential Contribution to SDGs through Environment

SDGs		Environment Impacts
1	No Poverty	
2	Zero Hunger	
3	Good Health and Well-Being for people	
4	Quality Education	NS
5	Gender Equality	
6	Clean Water and Sanitation	
7	Affordable and Clean Energy	
8	Sustainable Economic Growth & Decent Work	
9	Industry, Innovation and Infrastructure	
10	Reduced Inequalities	
11	Sustainable Cities and Communities	
12	Responsible Consumption and Production	
13	Climate Action	HP
14	Life Below Water	NS
15	Life on Land	NS
16	Peace, Justice and Strong Institutions	
17	Partnerships for the Goals	

HP : High Potential:
Direct impacts of Colluli have high potential to make a positive and significant contribution to SDGs.
NS : Natural Synergies:
Direct Impacts of Colluli have natural synergies with SDGs, however further actions are needed

4.6 Fiscal Effects

The analysis about the fiscal income generated by large scale mining activities based on foreign investment and, in general, due the exploitation of the non-renewable natural resources, is one of the most important aspects in the discussion about development and natural resources and it is critical aspect to the revenue of prospects in developing countries.

The analysis must include and face, at least, four important concerns and considerations related to:

1. How the legal tax framework for mining activities and its set of rules can generate balanced incentives for long term mining development, attract investment under a reasonable business risks and, of course, a fair distribution of mining benefits or 'resource rent' between foreign and national entities;

2. Transparency and accountability around tax collections;

3. How fiscal mining incomes can support the implementation of sound policies and programmes for the benefits of present and future generations of the country,

4. How to understand fiscal effects from the specific local and national context.

The study has prepared an analysis taking into account this considerations.

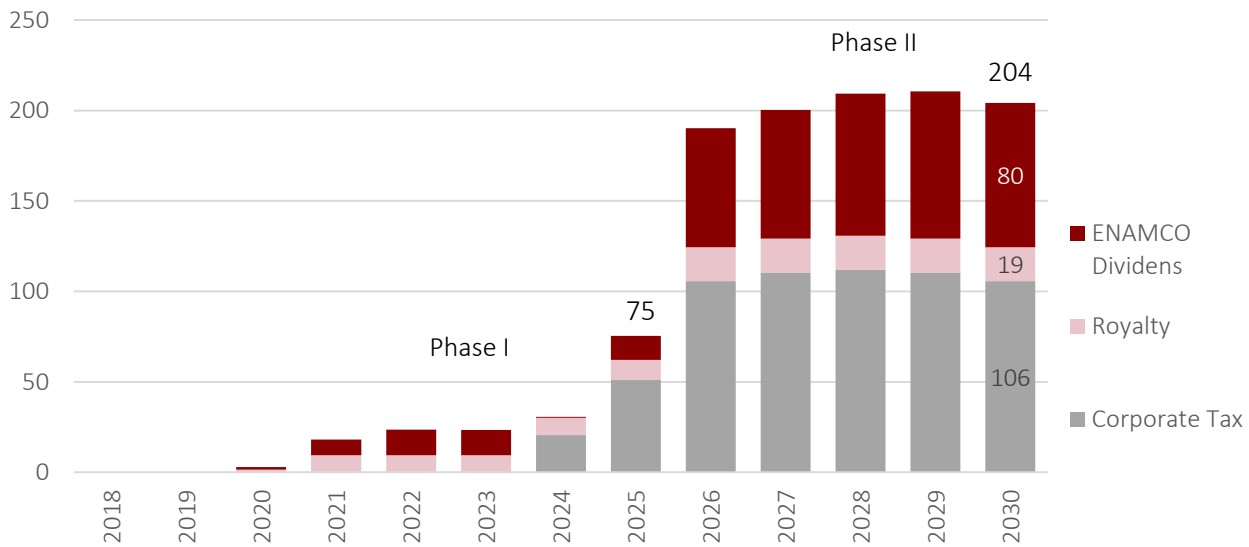
Structure of Colluli's Fiscal Effects

Considering Colluli has been designed under a 50:50 Join Venture of between Danakali and ENAMCO (state company) the potential fiscal effects generated by Colluli should be analysed considering two main streams for fiscal incomes: 1) Dividends and 2) Taxes.

Considering two development phases, during the period 2018-2030 Colluli could generate accumulated fiscal incomes of US$1,2 billions and more than US$200 million a year after 2026 (Figure 25). Taxes, including corporate/income taxes and royalties, represent 64% of the total amount collected; Fiscal incomes generated by ENAMCO's dividends represent 36% of the total.

The potential fiscal effects of these first two development phases of Colluli (for the hypothetic period of analysis) exemplify the substantial potential of the project that according to their geological reserves and future extraction planes could be developed for more than 100 years.

Figure 25 Total Fiscal Incomes generated by Colluli in Eritrea
US$ million



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total	%
ENAMCO Dividends	0	0	1	9	14	14	1	13	66	71	78	81	80	429	36%
Royalties	0	0	2	9	9	9	9	11	19	19	19	19	19	144	12%
Corporate Tax	0	0	0	0	0	0	21	51	106	110	112	110	106	616	52%
Total Direct Fiscal Incomes	**0**	**0**	**3**	**18**	**24**	**23**	**31**	**75**	**190**	**200**	**209**	**210**	**204**	**1,189**	**100%**

Analysis based on information of Danakali

Eritrean Tax Framework for mining development and Colluli: A balanced formula.

Taxes in Eritrea are regulated by the Income Tax Proclamations 62/1994, 64/1994 and 116/2001 with Mining Operations specifically governed by Proclamation No. 69/1995 (Proclamation to Provide for Payment of Tax on Income from Mining Operations). However, applicable matters not provided for in the mining proclamation (69/1995) will be governed by the other existing tax laws.

The analysis shows a balanced and healthy tax regime for mining development in Eritrea that allow generation of sufficient and necessary cash to service debt and repayment to investors through favourable depreciation rules and use of tax losses for up to 10 years. The basis for taxation in Eritrea has been stable for many years, and they are simple. These tax conditions are considered positive attributes for calculation of future project cash flows.

This information below provides a summary of main rules that affect Colluli Project in Eritrea.

Corporate/Income tax and depreciation

In accordance with Proclamation 69/1995 is calculated at a rate of 38% of taxable profit (which include 3.5% of Royalty). Taxable Income in Eritrea is computed on a historical accrual accounting basis by subtracting from gross income all allowable revenue expenditure, depreciations of PPE, pre-production and development costs (after deducting pre-commissioning income, if any) at the rate of 25% per annum, reinvestment deduction and permitted losses.

Exploration and study costs at depreciation rate of 25% per annum; if it is incurred before commencement of mining, however exploration and study costs incurred post commencement of mining are expensed in the period they are incurred. Tax depreciation commences when assets are ready for use and is calculated on a straight-line method over four consecutive years where no residual value is left at the end of the fourth year.

Characteristics of Tax Regime for Mining Development in Eritrea (Excluding ENAMCO s Dividends)

1. Stability
2. Simplicity
3. Reasonable level of incentives
4. Allow sufficient cash flow generation through depreciation
5. No tax free period
6. Income Tax
7. Royalty
8. Withholding Tax and Service Tax
9. No VAT

Tax Incentives and other taxes

- Reinvestment

A deduction equal to 5% of gross income is allowable for each accounting year. This amount is to be reinvested in other mining operations, or in other investments within Eritrea approved by the Eritrean Licensing Authority. Any part of such amount not reinvested by the end of the second accounting year following the deduction is included in the gross income of that second accounting year.

- Free Period of Income Tax

There is no Free Period of Income tax in Eritrea

- Carry forward of losses

Tax losses from mining operations in an accounting year can be carried forward and deducted from gross income in the following ten accounting years.

Tax losses for Colluli could arise from a combination of sunk exploration costs amortised at the rate of 25% per annum and accelerated tax depreciation (as explained above).

Carry back of losses is not allowed in Eritrea.

- Customs Duties and Taxes

Under Proclamation No. 69/1995, holders of a mining license and their contractors only pay 0.5% duty on all imports into Eritrea of equipment, machinery, vehicles and spare parts necessary for mining operations.
Exports of minerals by the operation are free of all duties and taxes.

- Withholding Tax and Service Tax

As with many service tax arrangements (i.e. Australian GST), service receivers are responsible for the collection of tax on behalf of the Tax Authority. Similarly service receivers in Eritrea are mandated to collect from non-resident service providers. In this case the withholding taxes are borne by the service receiver. Resident service providers directly pay with-holding tax due from them.

A holder of a Mining License is obliged either to bear or collect from service providers and pay quarterly a 10% Withholding Tax on behalf of any non-resident person or corporate on the gross value for any services, leases or license of intellectual property provided to the Licensee.

Income from on shore services rendered to a person or body in Eritrea is subject to a Service Tax (5% or 10% depending on type of service). Income from off shore services rendered to a person or body in Eritrea is not subject to service tax. If, however, the service provider is non-resident but being temporarily in Eritrea to render service, the Licensee is obliged to bear and pay the Service Tax on the gross value for any services. Resident service providers are mandated to collect service taxes from service receivers and will include service taxes as part of their charges to the Licensee.

“On shore” services are services rendered by being physically in Eritrea whereas “off shore” services are services rendered without physically coming to Eritrea.

Withholding and Service Taxes are not applicable to the acquisition of equipment, freight and mobilisation costs or dividends.

- VAT

There is no VAT in Eritrea.

The potential effects of Colluli on Fiscal budget of Eritrea.

Between 2010 and 2017, Eritrea has doubled its government revenues from US$ 393m (2010) to US$780 (2017) (according to IMF's estimations) (Figure 26). However, this positive increment represent only 14% of the Eritrean GDP (Figure 28) and has not been sufficient to keep a basic level of government expenditure and implementation of the necessary public policies and programmes.

The growing gap between revenues and expenditure of the government (Figure 26) has been covered by debt and international assistant (Figure 26). In the long term, it is clear that this growing fiscal deficit will not be sustainable.

Under this consideration, Colluli (specially after seven or eight years of operational activities) might represent a unique opportunity to start to reduce the Eritrean fiscal deficit, and contribute to build a healthier scenario in terms of government revenues and expenditures.

As a result of this, fiscal incomes generated by Colluli could become a baseline of government revenues to support the implementation of sound policies and programmes for the benefits of present and future generations of the country.

… Colluli's fiscal mining incomes could support the implementation of sound policies and programmes for the benefit of present and future generations of the country.

Figure 26 Government Revenues & Expenditure in Eritrea
US$ million (current)

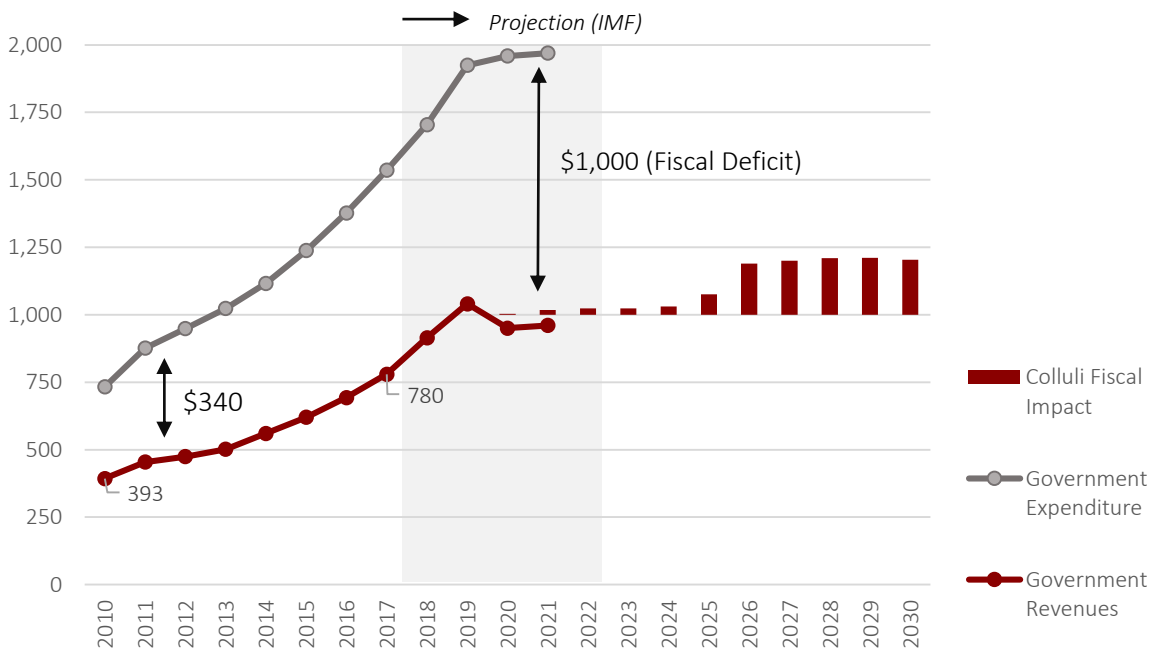
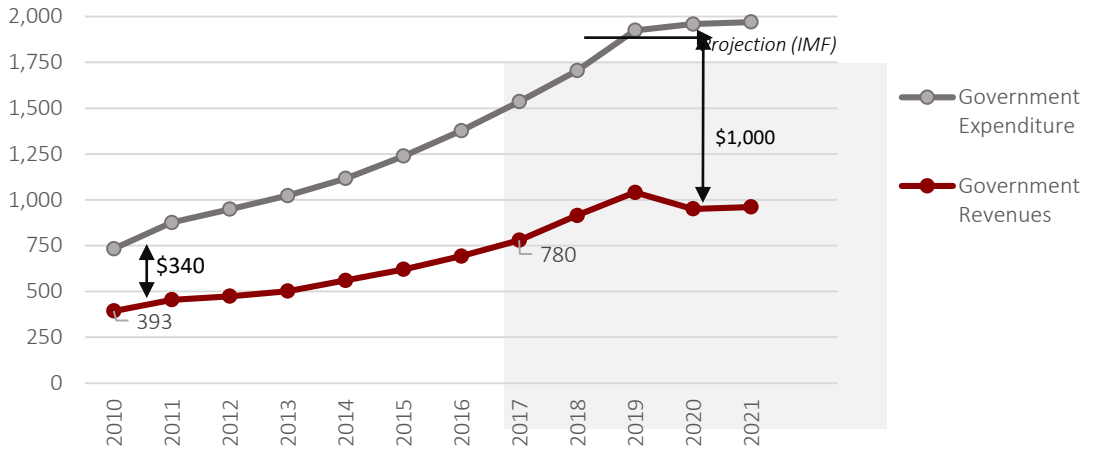
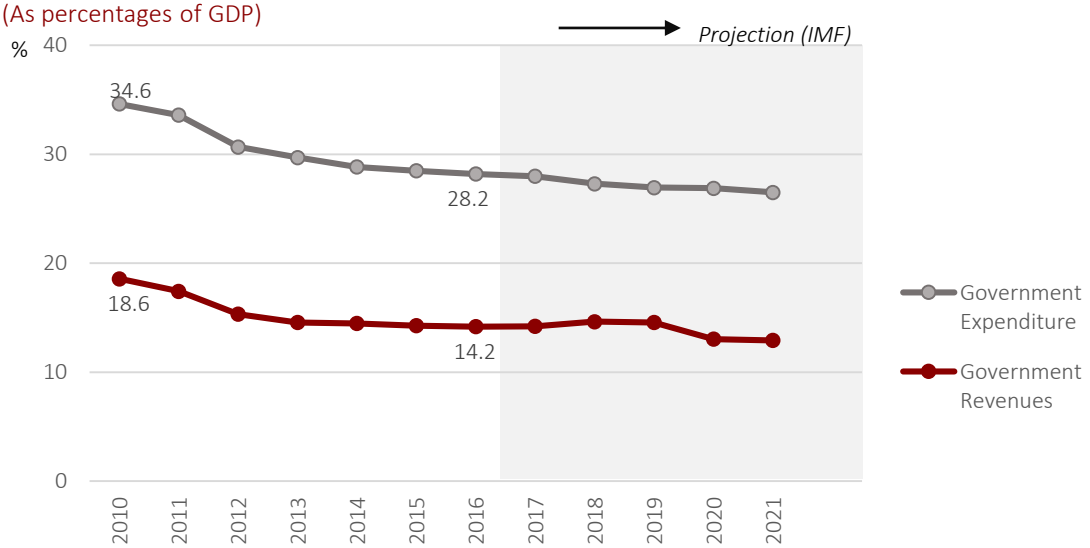


Figure 27 Government Revenues & Expenditure in Eritrea
US$ million (current)



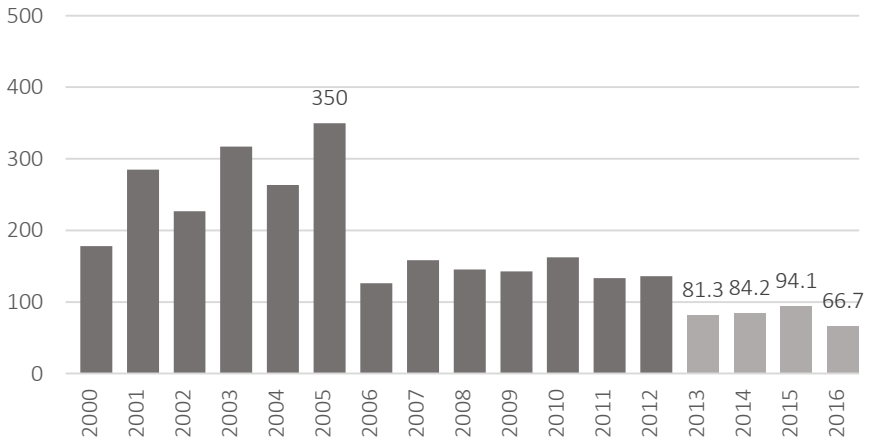
Sources: Analysis based on IMF data and projections

Figure 28 Government Revenues & Expenditure in Eritrea
(As percentages of GDP)



Sources: Analysis based on IMF data and projections

Figure 29 International Official Development Assistance Received
US$ million (current)



Sources: World Bank

Distribution of Colluli Benefits or Resource Rent

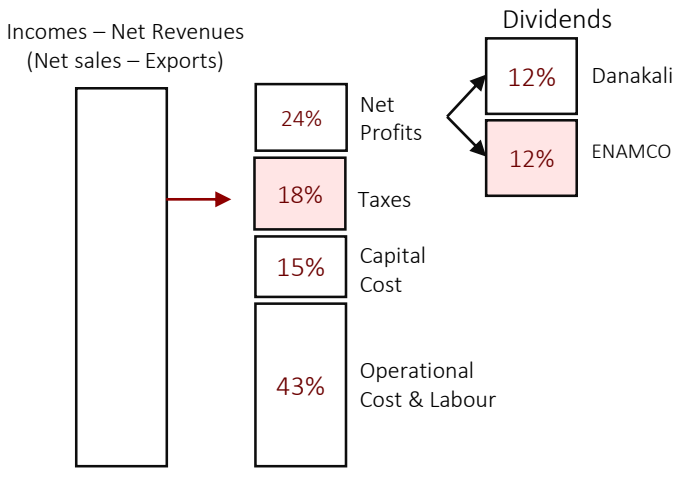
An interesting approach to analyse the impact on fiscal income of Colluli is to understand its fiscal contribution in relation to its own net revenues (or net sales) and in relative terms with other mining companies.

The analysis of the economic and financial cash flow of Colluli for the period 2018-2030 (or during the first 12 years of operation) shows Colulli fiscal impact can be equivalent to 30% of the accumulated net revenues for the period including corporate taxes, royalties and dividends of ENAMCO (Figure 30).

This expected percentage of 30% is substantially relevant when compared to global mining companies such as BHP or Anglo American with a total contribution to governments (taxes and other payments) no more than 12% (Figure 31).

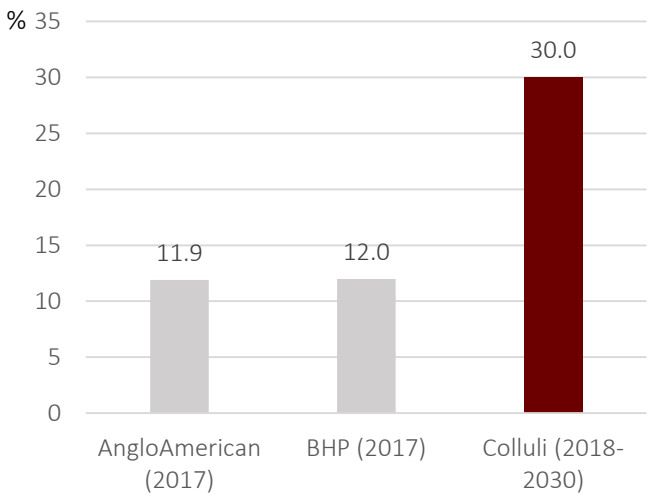
These figures provide information to evaluate in relative terms Colluli fiscal impact on resource rent.

Figure 30 Overview of Colluli's Impacts
(Accumulated percentages of the period 2018-2030)



Sources: Elaborated by this Study. Based on Danakali Cash Flow

Figure 31 Payment to Governments as % of Net Revenues
Colluli compared with and selected companies (1)



Sources:
1) Based on Sustainable Report 2017 of BHP and Anglo American

Potential Impact on Poverty Reduction of Fiscal Effects of Colluli

The potential effect on poverty reduction of Fiscal Impacts of Colluli will directly depend on public social policies and programs implemented, initial socioeconomic conditions of the People, and external factors that could affect planning and efficiency of government initiatives (and not directly of Colluli's payments).

However, an interesting theoretical exercise is to evaluate the cost of poverty reduction assuming a direct cash transfer to poor people. For this objective, it is possible to use the indicator 'poverty gap ratio' which measures/estimate the "average poverty deficit" of the entire population, where the poverty deficit is the per capita amount of cash that would be needed to bring all poor people above the poverty line through perfectly targeted cash transfers.

The indicator is a tool for measuring the per capita amount of resources needed to eliminate poverty, identifying the poverty depth in population groups which makes it a very useful indicator for policy makers and donors. For example, if a person has personal income of US$ 1.15 per day and poverty line is US$1.92, his or her poverty gap is about 40%. His or her yearly monetary value of poverty gap is US$281 (($1.92 - $1.15) x 365ds)

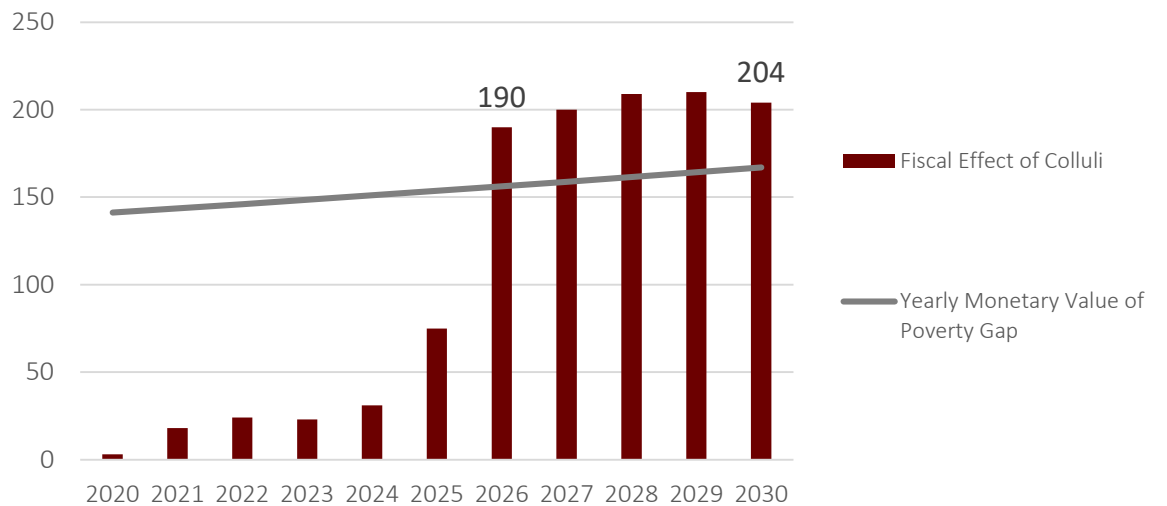
The poverty gap indicator in Eritrea (assumed by this study) is 20% (average of Eastern African Countries, World Bank Development Indicators). Thus, the yearly monetary value of poverty GAP in Eritrea to lift everyone out of poverty could be around US$150 million per year (period 2020-2030) (Figure 32).

Example: Year 2026.
Poverty Line = US$ 1,92 per day
Poverty Gap = 20% => US$ 1.92 x 20% = US$0.384 per person per day
Poverty Line (%) of total population = 19%
Population 2026 = 5,670,360
Total Poverty = 1,077,368 people
Yearly Monetary Value of Poverty Gap = 1,077,368 x US$ 0.384 x 365= US$ 151,003,963
Colluli Fiscal Impact 2026 = US$ 190,000,000.-

Hence, after 2026 Colluli fiscal impacts have the theoretical capacity to reduce poverty to zero assuming poverty GAP of 20% and direct cash transfer to poor people (assuming there are no efficiency losses and transaction costs).

This is just an illustration. Lifting of every person from poverty depends on poverty elasticity of not only income growth but also distribution and reaching the bottom 10 per cent of the population can be more difficult.

Figure 32 Comparative Analysis Between Fiscal Effects of Colluli And Yearly Monetary Value of Poverty Gap in Eritrea.
US$ Million / Poverty Gap 20% / Poverty 19% for the Period 2020-2030



Source:
Elaborated by this Study

Fiscal Incomes and Potential Contribution on SDGs

Expected Colluli's direct effects on fiscal income in Eritrea could create a more comfortable new scenario for fiscal planning, policy design and implementation of public social programs. Assuming that the main focus of the government social interventions will remain aligned with sustainable development priorities of the country, the Colluli's contribution to SDGs will be obvious.

Because of the intrinsic nature of any fiscal income and Eritrean context, it is predictable to observe strong connections with the SDGs from 1 to 6 and 10, where the priorities in terms of sustainable development are in terms of poverty alleviation, health, education, gender issues, sanitation and inequalities. However, because of the size of the fiscal impact of Colluli (in relation to the current situation of total fiscal revenues of the Country), it is also likely to expect a contribution in terms of Goals 16 and 17, specially in terms of Peace, strengthened of public institutions and partnerships for the goals.

Table 13 Potential Contribution to SDGs through Fiscal Incomes

SDGs		Fiscal Impacts
1	No Poverty	HP
2	Zero Hunger	HP
3	Good Health and Well-Being for people	HP
4	Quality Education	HP
5	Gender Equality	HP
6	Clean Water and Sanitation	HP
7	Affordable and Clean Energy	NS
8	Sustainable Economic Growth & Decent Work	
9	Industry, Innovation and Infrastructure	
10	Reduced Inequalities	HP
11	Sustainable Cities and Communities	
12	Responsible Consumption and Production	
13	Climate Action	
14	Life Below Water	
15	Life on Land	
16	Peace, Justice and Strong Institutions	HP
17	Partnerships for the Goals	HP

HP : High Potential:
Direct impacts of Colluli have high potential to make a positive contribution to SDGs.
NS : Natural Synergies:
Direct Impacts of Colluli have natural synergies with SDGs, however further actions are needed

4.7 Impact of potash and other mineral fertilizers

The discussion about Agriculture and Food Security, in the context of sustainable development and social progress represents one of the most significant challenges for developing countries and for the global society in general. This is also a major concern in Eritrea and Africa.

Agriculture and Food Security involve an important part of the population and their social conditions and improvement efforts must consider multidimensional and interconnected development factors such as: social issues related to working conditions and life styles; conditions in terms of traditions, habits and nutrition; the role of public institutions to create sound policies and implement efficient programs; environmental and climate conditions; financial resources to support growing needs of capital and infrastructure; access to markets; training, capacity building and research; and obviously challenges related to the quality of soil, availability of fertilizers and their fundamental connections with productivity of crops and economies of scale of farmers, to mention a few.

Thus, understanding the complexity of Agriculture and Food Security, Colluli Project has the potential to play a key role in Eritrea and Africa during the following decades. Firstly, as mining producer of mineral fertilizers that could significantly change/improve current availability of fertilizer in the country and Africa that probably will generate positive effects on crops productivity. Secondly, because the company (Owners: Colluli and ENAMCO in this case) has recognised this complexity and consequently designed a project based on solid and clear corporate policies related to Social Investor and Shared Value Solution, to support and facilitate fertilizer distribution its necessary sound public policies and programs.

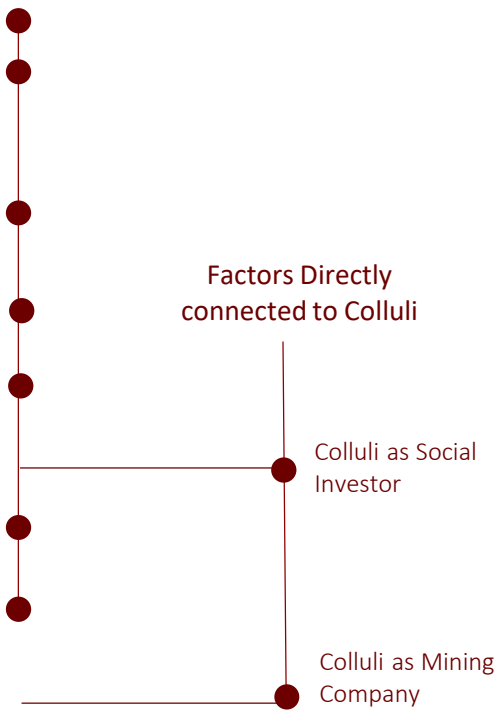
Colluli connections to development factors That affects Agriculture and Food Security.

This Study, based on different sources, literature review and interviews with key stakeholders of Eritrea, has identified ten factors (Table 14) that should be included in the formula to understand the relationship between Agriculture and Food Security in Eritrea, and specific factors that are directly connected to Colluli.

Of course, the first connection of Colluli is as mining company or fertilizer producer. However, considering the context in Eritrea, it is highly relevant Colluli approach to develop a corporate policy as a *Social Investor Company to ensure the availability of fertilizer in Eritrea.*

Table 14 Factors that affect Agriculture and Food Security in Eritrea

1	Type of Crops and Products
2	Farming Productivity, Practices, Technology, Tools
3	Environmental conditions, External Shocks, Past Degradation of Land
4	Infrastructure, Irrigation, Water, Storage, Road and Transport
5	Social Issues (Gender, Labour Rights, Child in Labour Force, and Employment conditions)
6	Value Added from Market and commercial perspective
7	Partnership – Alliances Public Private International Organization
8	Public Policies (taxes, subsidies, financing)
9	Scientific Knowledge and Research conserve the genetic diversity of food crops in gene and seed banks
10	Availability of Fertilizers



Source: Analysis developed by this Study based on different sources

Understanding the complexity of the function: Fertilizer + Small farmers +Agriculture + Food Security

For several decades, fertiliser demand has been low in Sub Saharan Africa. In a study of Burkina Faso, Koussoube and Nauges (2016) noted that: "…These findings suggest that the low uptake of chemical fertilisers might have been driven by factors other than profitability, including insufficient supply of subsidised fertilisers to farmers in need. Our results also call for increasing the availability of credit to farmers in order to encourage adoption of chemical fertilisers.". Their study highlights that while incentives and traditional explanation of relative cost of fertiliser to crop are important, other relevant factors include delivery of the fertiliser to farm gate and education and support programme including credit and other social support mechanisms.

In another study, Druilhe and Barriero-Hurle (2012) review the experience of fertiliser subsidies in 14 African countries and conclude that: "The new generation of input subsidies ('smart' subsidies) brings innovations in design (e.g. targeting; vouchers) to support both the most constrained farmers and encourage the development of input markets. Available evidence, albeit very limited, suggests that such programmes have been effective in raising fertilizer use, average yields and agricultural production but that their success is highly dependent on implementation." Their study highlights the importance of implementation of such Smart subsidies.

From a study using Living Standards Measurement Studies Data for six countries and covering a very large simple of over 22,000 households, Sheahan and Barrett (2017) shed light on several preconceptions about African small holder agriculture. They find that contrary to established stylised fact that African farmers use very small amount of inorganic fertilisers, the LSMS study showed that actually there is quite a range and some farmers do use significant amounts of fertiliser. What is however interesting was that irrespective of whether soil quality is good, mediocre or poor, farmers seem to be using about the same quantity of fertiliser and that very few farmers used credit to purchase fertilisers. Another important finding in their study concerns the country effect: "Quite surprisingly, the overwhelming amount of variation, indeed nearly half (45%), is accounted for by the country dummy variables. Even controlling for a wide range of important observable household-level and agro-ecological variables, some combination of other policy, institutional, or macroeconomic variables explain most of the micro-scale variation in inorganic fertilizer use in this unprecedentedly large sample of over 22,000 households. … This is a significant finding, as clearly the policy and operating environments facilitated by governments matter."

Source: Literature review by the authors

Colluli Production: Potash and other minerals fertilizers.

Potash is the common term for fertiliser forms of the element potassium (K). The name derives from the collection of wood ash in metal pots when the beneficial fertiliser properties of this material were first recognised many centuries ago.

Potassium is one of three key fertiliser 'macro-nutrients' essential for healthy soil and plant growth. It is generally used in combination with the other two macro-nutrients, nitrogen and phosphorus, to produce a range of fertilisers, the type used being dependent on the soil to which it will be applied.

Potassium is essential to the workings of every living plant cell. It not only plays an important role in plants' water utilisation but also helps regulate the rate of photosynthesis. Potassium promotes the growth of strong stalks, protects plants from extreme temperatures and enhances their ability to cope with stress. Importantly, there is no substitute for potash.

Commonly, Potash refers to Potassium Chloride or Muriate of Potash (MOP), however, a number of other potash variants exist with premium potash types containing micro nutrients as well as macro nutrients such as potassium sulphate, potassium magnesium sulphate and potassium nitrate.

Potassium bearing minerals are typically found in areas where ancient inland seas have evaporated leaving behind their minerals. The Danakil salt basin is a positively unique example as it is one of only very few known potash deposits where kainite, a sulphate bearing mineral key for potassium sulphate production, is found in solid form.

The potassium bearing salts within the Colluli Resource have the unique capability of producing a diverse range of potash types including sulphate of potash (SOP or potassium sulphate), muriate of potash (MOP or potassium chloride) and sulphate of potash magnesia (SOPM or potassium magnesium sulphate).

Danakali

Productivity in Agriculture in Eritrea
A macro perspective

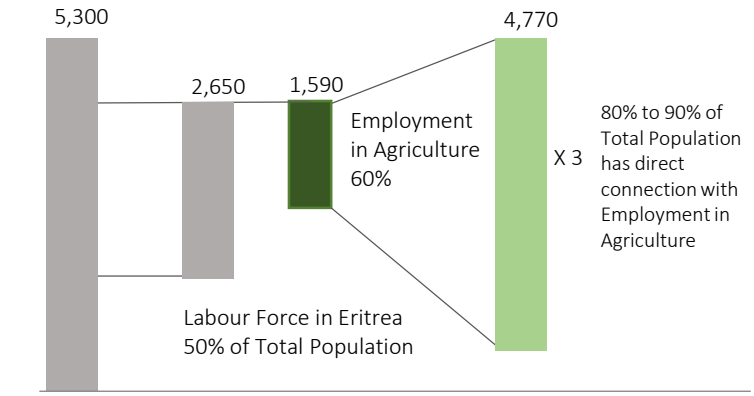
It is estimated that around 1.5 million of people directly work in the agriculture sector in Eritrea, representing around 60% of the total labour force of the country. Because of that, around 80%-90% of the population has a direct connection with the sector evidencing how important this economic activity is for the national sustainable development agenda, and from the specific perspective of this study how crucial is to understand the relationship between fertilizer and productivity in agriculture.

At macro level, productivity in Agriculture in Eritrea can be characterized assessing the relationship between Employment in Agriculture and GDP in Agriculture. In other words, assessing the capacity of the Eritrean labour force to generate value added in this sector.

Figure 33 and 34 show three key characteristics of the employment in agriculture in Eritrea: 1) Employment in Agriculture remains in a very high level around 60% (+/-) of the total labour force; 2) participation of employment in agriculture does not show significant fluctuations between 2000 and 2017, 3) the current capacity to generate value added of the labour force in agriculture is 17% and could be showing a decrease.

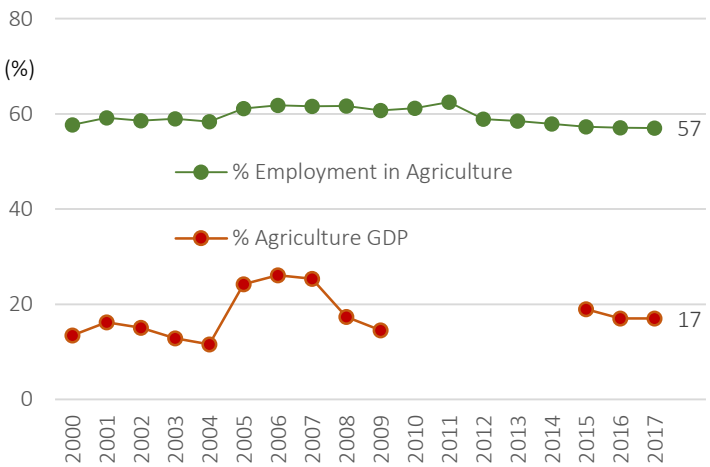
Behind this figures, it is highly probable that the sector is evidencing notorious symptoms of structural constrains linked to low level of productivity.

Figure 33 Population, Labour Force and Employment in Agriculture (and its related population in Eritrea. Estimation 2020



Sources:
1) % of Labour Force and % of Occupied: ILO
2) Projections 2018-2030 based on % Labour Force = 50% of total population and 7% of Unemployment

Figure 34 Relationship between Agriculture GDP (%) and Employment in Agriculture (%) In Eritrea



1. World Bank database: Development Indicators

Figure 35, 36 and 37, show a complementary analysis about the productivity in the Agriculture sector of Eritrea.

GDP generated by the sector (Figure 28) reached US$830 million in 2016. This amount shows a productivity per person of US$690 a year (Figure 35) and a productivity per day of US$ 1,90 (Figure 37).

This productivity should be understood as an estimation of the current capacity of income generation per year per each person working in the sector. Otherwise, the total available income for a person working in Agriculture and its dependants.

Figure 35 Agriculture GDP in Eritrea
US$ Million - Current

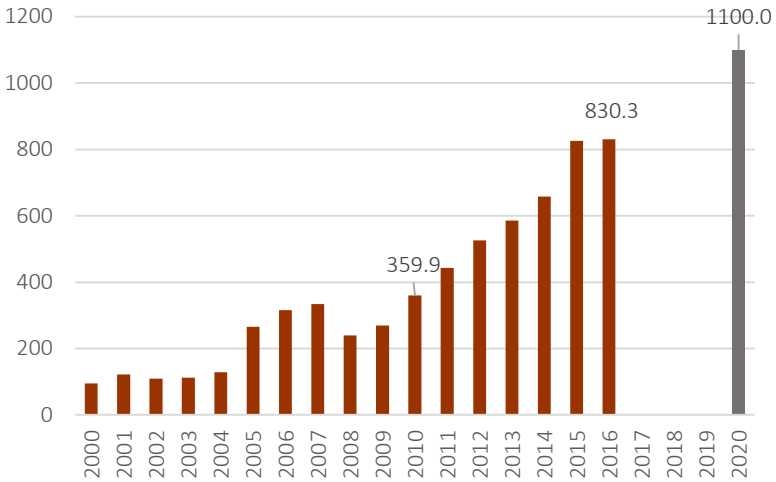


Figure 36 Annual Productivity in Agriculture in Eritrea
Agriculture GDP/ Employment in Agriculture
US$ - Current

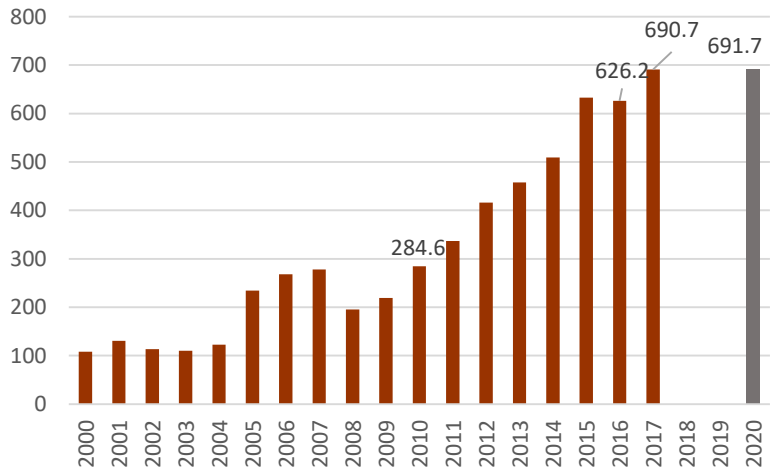
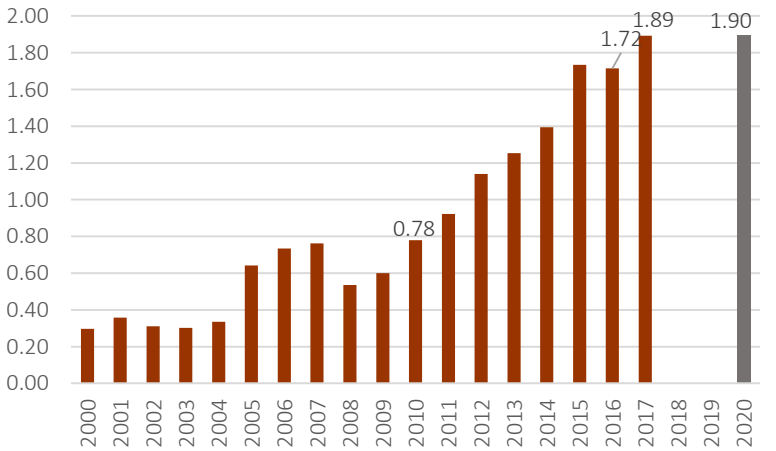


Figure 37 Productivity per day in Agriculture in Eritrea
GDP per day in Agriculture/ Employment in Agriculture
US$ - Current per worker a day



Considering around 80%-90% of the total population in Eritrea is affected by this productivity, common sense questions immediately arise: What should Eritrea do to move Agriculture sector to another level of income and productivity? (Figure 38)

In addition, and taking into account that average fertilizer consumption in Eritrea is between 2010-2015 was 1,2kg per Ha (Figure 39), the common sense question is : What is the potential effect that Colluli fertilizer could have in terms of Agriculture productivity in Eritrea?

The direct and simple answer to this question will be specifically related to the types of crops (considering that some crops require specific types of fertilizer), the future availability of Colluli fertilizers in Eritrea (which percentage of the Colluli production could be allocated to the country) and the efficiency in terms of distribution of fertilizers and capacity building of the farmers in the country.

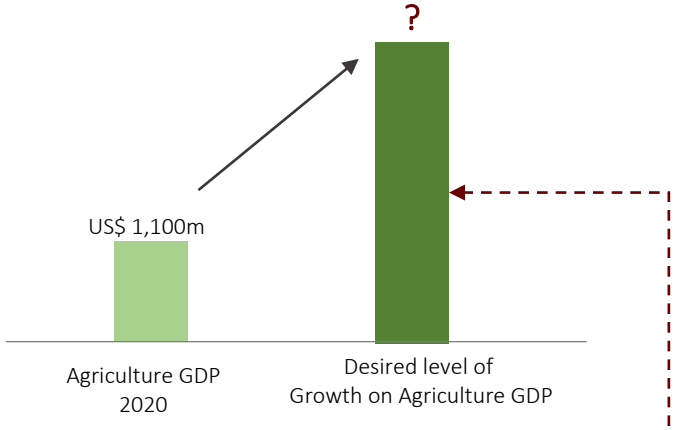
Of course, behind these simple answers there are significant considerations, however the final response to the question should be positive considering:

i) Discussions with stakeholders in Eritrea suggest that there is widespread support for allocating up to 10 per cent of Colluli production (potash) at cost price. This amount should be sufficient to satisfy current needs of fertilizer consumption in the country.

ii) Currently, the Ministry of Agriculture already has a distribution program of fertilizers in the country. This program should be the satisfactory starting point.

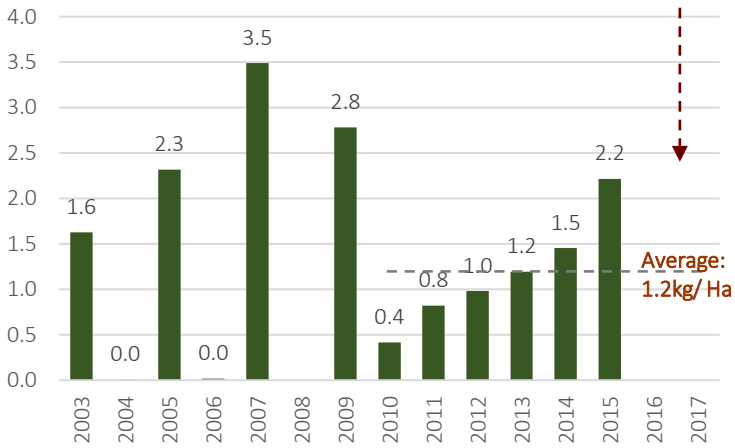
It is not within the scope of this study to estimate figures linked to future conditions of agriculture in Eritrea, productivity and final social effects of Colluli. However the study has analysed Colluli's agreements and interviewed different authorities to confirm that it is unrealistic to expect enormous growth or unprecedented changes to agriculture in the country.

Figure 38 What should Eritrea do to move Agriculture sector to another level of income, productivity?



Source: Prepared by this study

Figure 39 Fertilizer consumption in Eritrea (kilograms per hectare of arable land)



Source: World Bank. Development Indicators

Key Data in Eritrea:

Arable Land (% of total land)	: 6.8%
Arable Land in Eritrea	: 690,000 ha
Total Fertilizer Consumption in Eritrea	: 1,518 Tons

Agriculture in Eritrea:
Production of Fruits and Vegetables

Figures 40 and 41 show the evolution of total production of Fruits and Vegetables and the total land used.

These figures illustrate:

- For the period 2000-2017, both type of crops show a correlation between total production and land used, evidencing a very low level of improvements in terms of land productivity. Hence, important increment in terms of production are only linked to increments in terms of the land.

- There are important and negative productive periods. Between 2010 and 2015, fruit production decreased from 130,000 tonnes to 75,000 tonnes and between 2008 and 2013 vegetable production decreased from 275,000 tones to 150,000 tonnes.

This situation explicit how severe could be a decrease in production for the country and how this could affect food security. It is possible to find different reasons: shortage of inputs, drought, shortage of water, flood damage, land reallocations program, interruptions of land on rent, among others, however from a development and humanitarian perspective it is necessary to point out how fragile is the situation of the country in terms of agriculture and food security.

Figure 40 Production of Fruits
Total per year Tons) and used land-area (Ha)

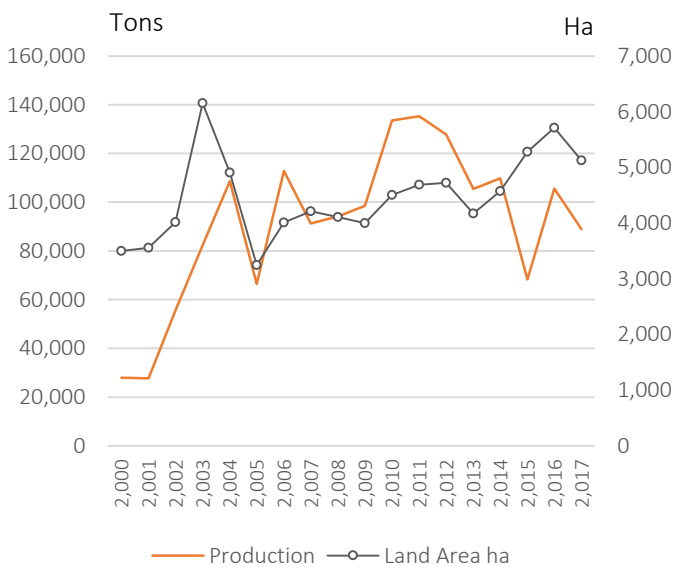


Figure 41 Production of Vegetables:
Total per year Tons) and used land-area (Ha)

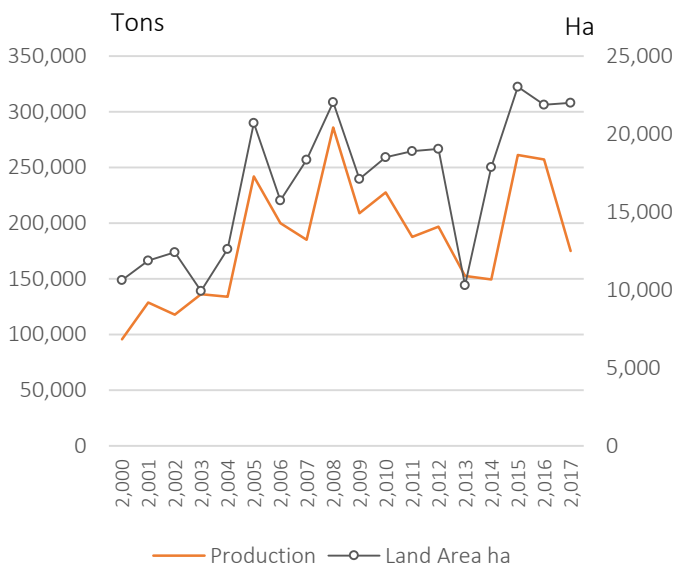


Table 15, 16 and 17 show the agriculture production by type of Crops in Eritrea: Fruits, Vegetables and Cereals and how diverse and dynamic could be the sector in the country if improvement and new tools linked to productivity could be implemented.

Colluli's fertilizers could have significant implication to boost some specific types of crops and make an impact in terms of productivity and diversity of crops.

It will be crucial to generate more detailed and accurate scientific information to better understand technical implications of future Colluli's fertilizers by crops and according to the soil conditions in Eritrea and water availability.

Table 15 Production of Fruits (2017)

	Production Quintals	%
Orange	21,154	20.8
Lemon	5,737	5.6
Mandarin	115	0.1
Banana	66,657	65.6
Papaya	4,934	4.9
Mango	1,042	1.0
Date palm	34	0.0
Apple	211	0.2
Peach	354	0.3
Grape fruit	1,440	1.4
Total	**101,676**	**100.0**

Table 16 Production of Vegetables (2017)

	Production Quintals	%
Tomato	36,806	17.1
Potato	33,908	15.8
Onion	65,706	30.6
Pepper	24,406	11.4
Cabbage	16,022	7.5
Lettuce	7,882	3.7
Carrot	3,303	1.5
Egg plant	961	0.4
Squash	3,454	1.6
Garlic	1,159	0.5
Molokia	1,375	0.6
Pumpkin	10,323	4.8
Water melon	5,541	2.6
Okra	3,961	1.8
Beet root	Yield is negligible	
Cauliflower	Yield is negligible	
Sweet potato	Yield is negligible	
TOTAL	**214,806**	**100**

Table 17 Production of Cereals (2017)

	Production Quintals	%
Wheat	111,180	6
Maize	76,880	4
Sorghum	867170	49
Taff	127,292	7
Finger millet	96,320	5
Pearl millet	145,934	8
Barley	202,737	11
Others	159,727	9
Total	**1,787,240**	**100**

Potash, Potato and Potential for Prosperity
Case Analysis

"In recent years the Eritrean Government has come to recognise the Potato as a strategic crop which can enhance national food security. Current potato production is 30,000 tons annually but the Ministry of Agriculture are targeting an increase to 150,000 tons annually by 2030, which would make the potato the single most important growth crop in Eritrea. Such production would provide substantial food security and incomes to farmers, provide affordable staple food to consumers and drive food export and processing. The Eritrea Ireland Development partnership accordingly is now prioritising potato and driving a national potato programme through innovation in seed production technologies, training of potato experts and PhD research.

The special value of potato in Eritrea relates to its productivity per scarce resource (land area, irrigation water, carbon emission). Recent studies indicate that application of Sulphate of Potash (such as to be produced in Colluli) increases productivity per each of these scarce resource and especially for water which is the critical constraint in Eritrea. Studies and soil analysis conducted in Teagasc in Ireland and Hamelmalo University in Eritrea show that application of Sulphate of Potash provides Eritrean farmers with yield increases of 15 to 40% and averaging 20%. On the other hand, without regular application of potash, soil fertility and potato yields will diminish over time.

In terms of SDG 2 and delivering increased agriculture productivity, potato has unique potential. While current yields average 12 tons, a pilot programme in 2016/17 reveals that farmers are sustaining yields in excess of 36 tons where they use improved clean seed and apply fertiliser.

Taking the target of 150,000 tons of potato production by 2030 and assuming a contribution of 20% by potash to sustainable yields, this would indicate that application by 10,000 farmers of sulphate of potash can contribute 20% towards the 150,000 or 30,000 tons annually. This implies the potential contribution of potash in potato as equivalent to almost 10% of the current level of national food production. "

Source: Vita and Eritrea Partnership Project Team

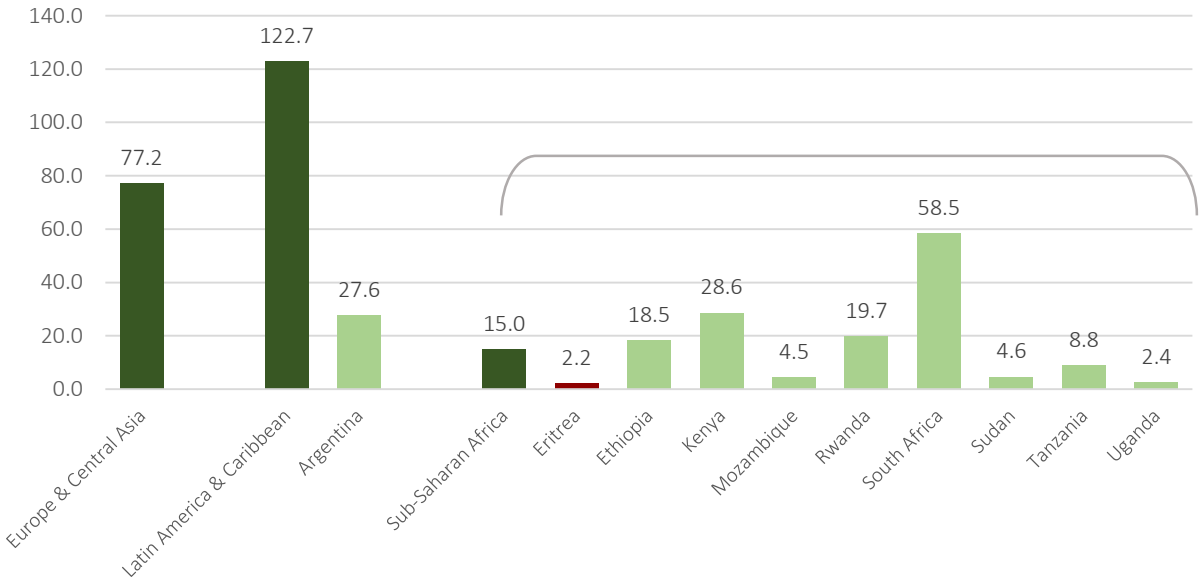
Potash and mineral fertilizer beyond Eritrea:
Fertilisers galore in Africa

At global level, productivity in Agriculture in Africa is not in the best situation and shows also important gaps and differences among countries (see Figures 42 and 43). However, African understanding of productivity have been progressing consistently beyond the specific relationship between Employment and GDP in Agriculture. Currently, it is common understanding that issues linked agriculture have sustainable implications, require investment, and a multidimensional and multi-sector approach.

Until recently, fertiliser consumption by African farmers was much smaller compared to farmers elsewhere and such fertilisers had to be mainly imported into Africa. However, this is changing. Colluli can become the world's largest SOP producer because of the natural advantage. While African nations have some of the lowest fertiliser consumption per hectare, many large fertiliser investments are in progress. Morocco already boasts one of the world's largest phosphate mines and the OCP Group reports that these contribute to 20 per cent of Morocco's exports. A news report in *The East African* (May 2016) mentions that Tanzania Petroleum Development Corporation is to build a $3 billion fertiliser factory to utilise its natural gas to produce 3.8 million tonnes of fertiliser per annum. *The African Courier* reported in July 2017 that Nigeria commissioned the world's biggest single train urea plant in Port Harcourt. The report says that the plant built by Indorama Eleme Fertilisers and Chemicals limited has a production capacity of 1.5 million tonnes of urea per annum.

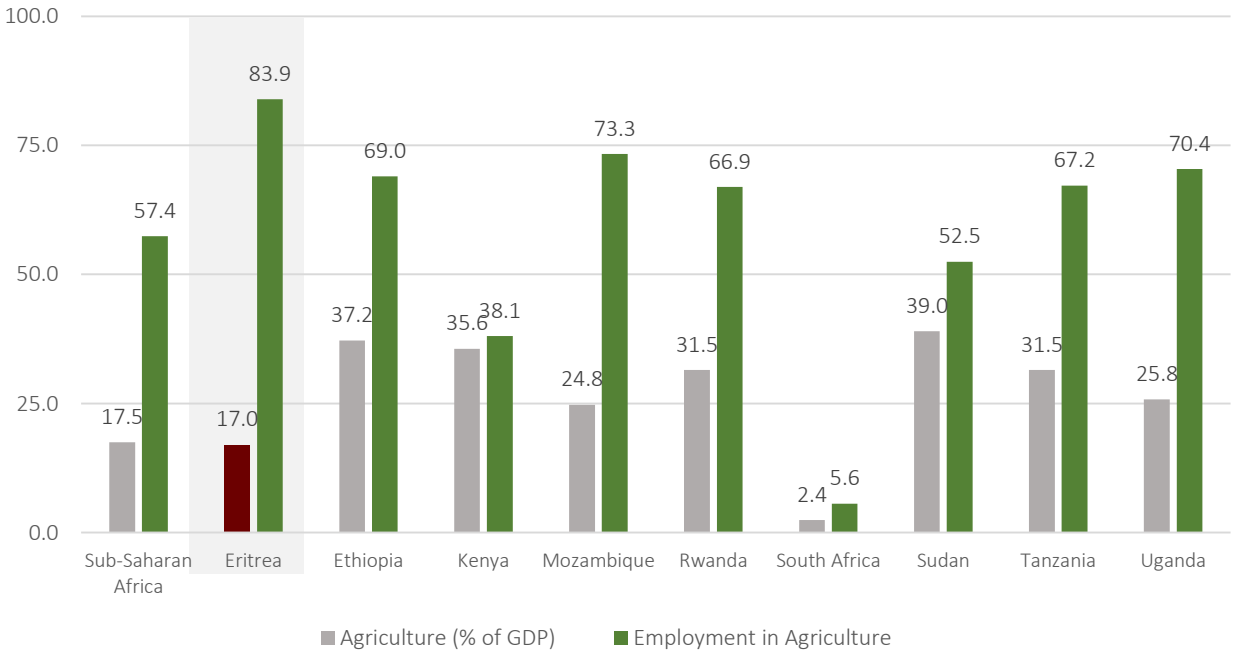
From the above examples the potential impact of Colluli on African agriculture, employment and GDP can be better understood. In many countries in Africa, agriculture remains the largest sector of the economy. Potash and other agro-chemicals from Colluli combined with infrastructure and capacity building can boost productivity, agricultural output and food security as also create further employment in these countries and contribute to boosting rural incomes and poverty reduction.

Figure 42 Fertilizer consumption (selected countries) 2015
(kilograms per hectare of arable land)



Source: Own Analysis based on World Bank: World Development Indicators

Figure 43 Relationship between Agriculture GDP (%) and
Employment in Agriculture (%) In Eritrea



Source: Own Analysis based on World Bank: World Development Indicators

Potential Contribution to SDGs

Colluli production (potash and other minerals fertilizers) has natural and important connections to five Sustainable Development goals: 1, 2, 5, 9 & 10, and because of its corporate policies the project could positive effects in terms of SDG 17.

Considering the characteristics of employment and productivity in Agriculture in Eritrea, and only in terms of Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture, the production of Colluli could improve agricultural productivity and incomes of small-scale food producers, family farmers.

In addition, the introduction in the country of new high quality of fertilizer can create a new baseline to maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species.

Regarding Goal 17, For example, the project could enhance regional and international cooperation on and access to science, technology and innovation and enhance knowledge-sharing on mutually agreed terms.

Table 18 Potential Contribution to SDGs through Potash & other Mineral Fertilizers

SDGs		Potash and other minerals fertilizers
1	No Poverty	HP
2	Zero Hunger	HP
3	Good Health and Well-Being for people	NS
4	Quality Education	NS
5	Gender Equality	HP
6	Clean Water and Sanitation	
7	Affordable and Clean Energy	
8	Sustainable Economic Growth & Decent Work	
9	Industry, Innovation and Infrastructure	HP
10	Reduced Inequalities	HP
11	Sustainable Cities and Communities	
12	Responsible Consumption and Production	HP
13	Climate Action	
14	Life Below Water	
15	Life on Land	
16	Peace, Justice and Strong Institutions	
17	Partnerships for the Goals	HP

HP : High Potential:
Direct impacts of Colluli have high potential to make a positive and significant contribution to SDGs.
NS : Natural Synergies:
Direct Impacts of Colluli have natural synergies with SDGs, however further actions are needed

5 Summary of Potential Contributions to SDG

5.1 Potential Contribution to SDGs

5.1 Potential Contribution to SDGs

The analysis discussed in this report shows that Colluli presents an opportunity to enhance the development strategy in Eritrea to realise the SDGs.

However, in this context, there are two possible approaches to achieving SDGs.

One is to continue '**business as usual**' (BAU). Because of Eritrea's strong trajectory in achieving some of the MDGs (especially the health MDG), even in the BAU scenario, some progress will continue to happen with regard to SDGs. Such achievement of SDGs will take place mainly due to natural synergies (NS) rather than any extra strategic intervention.

The second is to use the **fiscal income** from Colluli (and indeed other mining projects) to **allocate to specific sectors and record the achievements in relation to SDGs**. Such investment can have a multiplier effect and replicate what has been achieved in health sector with regard to MDGs with all the SDGs but especially on no poverty, zero hunger and so on.

According to our analysis, Colluli has the potential to generate significant direct impacts on Sustainable Development Agenda of Eritrea and it is possible to observe high potential of contribution on 13 specific SDGs and natural synergies with most of them. However, the final effects on SDGs will be highly connected to fiscal Impacts and impacts that will be generated by Colluli's final products.

One set of potential contributions is related to the areas of impact: Economic Value Generated, People, Community & Society, and Environmental impacts. The most important set of potential contributions is related Fiscal Impacts and production of potash and other mineral fertilizers.

Table 19 Colluli Potential Contributions to SDGs

SDGs		Area of Direct Impacts				
		Economic Value Generated	People, Community & Society	Environment Impacts	Fiscal Impacts	Potash and other minerals fertilizers
1	No Poverty	NS	NS		HP	HP
2	Zero Hunger				HP	HP
3	Good Health and Well-Being for people		NS		HP	NS
4	Quality Education	NS	NS	NS	HP	NS
5	Gender Equality		NS		HP	HP
6	Clean Water and Sanitation				HP	
7	Affordable and Clean Energy				NS	
8	Sustainable Economic Growth & Decent Work	HP	HP			
9	Industry, Innovation and Infrastructure	HP				HP
10	Reduced Inequalities				HP	HP
11	Sustainable Cities and Communities					
12	Responsible Consumption and Production					HP
13	Climate Action			HP		
14	Life Below Water			NS		
15	Life on Land			NS		
16	Peace, Justice and Strong Institutions	HP			HP	
17	Partnerships for the Goals	HP			HP	HP

HP : High Potential:
Direct impacts of Colluli have high potential to make a positive and significant contribution to SDGs.
NS : Natural Synergies:
Direct Impacts of Colluli have natural synergies with SDGs, however further actions are needed

Final Reflections

Reflections of Cristian Parra

Colluli can be an important source of direct impacts in Eritrea and make a positive contribution to the development Agenda in the country. Nevertheless, it is necessary to understand that behind numbers and figures there are always real people demanding effective improvements on the quality of life and basic social conditions.

Sustainable Development Goals provide a fantastic framework of analysis to visualize common goals and an inclusive approach to understand development, and because of that, we encourage government representatives, corporate executives, international community and the stakeholders of Colluli to use this document as a first step in this journey of building a shared vison about the future and a new relationship between natural resources, investors, governments, and society.

Colluli will only succeed in terms of contribution to SDGs through the coordination of policy makers, civil society and international development agencies. Together it is possible to transform natural resource extraction into real development and social progress for the People of Eritrea.

Colluli can not be a missed opportunity in terms of sustainable development.

Reflections of P Anand

Can you really learn and comment about the development trajectory of a nation within a short period of time? When we embarked on this study I was aware of the immensely short duration of our study and the scope for the various biases and traps including the 'headquarters trap' and the danger of 'rural development tourism' as Robert Chambers (2006) warned us all development professionals. Yet, the opportunity to learn about Eritrea and to be part of this unique situation in an effort to contribute to SDGs by however small an extent is hard to forego. And we hope this immensely short study period is only the beginning of a longer journey to understand the complex challenges of development of a young nation. In ideal circumstances, I would have liked to have done more extensive fieldwork and qualitative interviews to better understand the social and ecological systems and how a framework such as the one developed by Ostrom can be applied for natural resources management in Eritrea.

Development is in essence about people and about enhancing opportunities. Numbers, models and estimates cannot capture the complex possibilities though they can help us gain insight of certain aspects. Almost all nations that have used their natural resources successfully to transform their economy developed robust and long term policies, greater transparency and adaptable but resilient institutions. While poverty is multi-dimensional, development strategies to reduce it also have to be multi-dimensional and inclusive. The success of the Colluli on delivering SDGs will hinge on the capacity to design and deliver such multi-dimensional policies in an inclusive way.

Annex 1
Colluli Direct Impacts and Selected Targets by SDGs

Selected SDGs and Targets that could have direct connection to Economic Value Generated by Colluli

Goal 8.

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Targets

8.1 Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries.

8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors.

8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.

8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all.

8.a Increase Aid for Trade support for developing countries, in particular least developed countries, including through the Enhanced Integrated Framework for Trade-related Technical Assistance to Least Developed Countries.

Goal 9.

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Targets

9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.

9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries.

9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets.

9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States

9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities.

Goal 16.

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Targets

16.6 Develop effective, accountable and transparent institutions at all levels

Goal 17

Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development .

17.3 Mobilize additional financial resources for developing countries from multiple sources.

17.5 Adopt and implement investment promotion regimes for least developed countries

17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed.

17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the Sustainable Development Goals, including through North-South, South-South and triangular cooperation

17.11 Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020

17.13 Enhance global macroeconomic stability, including through policy coordination and policy coherence

17.14 Enhance policy coherence for sustainable development

17.16 Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries.

17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships.

Selected SDGs and Targets that could have direct connection to direct effects linked to People & Society

Goal 8.

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Targets

8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors

8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services.

8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training

8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment.

8.b By 2020, develop and operationalize a global strategy for youth employment and implement the Global Jobs Pact of the International Labour Organization

Selected Targets and Goals Connected to Environment

Goal 13.

Take urgent action to combat climate change and its impacts

Targets

13.2 Integrate climate change measures into national policies, strategies and planning

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

Selected Targets and Goals Connected to Fiscal Impact generated by Colluli

It is necessary to remark that this study is not in the position to stablish Eritrean's priorities and recommend specific actions in terms of fiscal income allocation. This is an internal and national tasks.

However, following the objectives of this study and considering all SDGs are important, it is necessary to highlight several Sustainable Development Goals and specifics targets (linked to most vulnerable people) where the future fiscal effects (because of the size and long term effects) could have a significant impacts if resources were allocated there.

Goal 1.

End poverty in all its forms everywhere

Targets

1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day

1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions

1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable

1.a Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions

1.b Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions.

Goal 2.

End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

Targets

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons

Goal 3.

Ensure healthy lives and promote well-being for all at all ages

Targets

3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births.

3.2 By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births

3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases

3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being

3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes

3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all

3.b Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all

3.c Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States.

Goal 4.
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Targets

4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes

4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education

4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university

4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.

4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy

4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

Goal 5.
Achieve gender equality and empower all women and girls

Targets

5.1 End all forms of discrimination against all women and girls everywhere

5.2 Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation

5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation

5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate

5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life.

5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences

Goal 6.
Ensure availability and sustainable management of water and sanitation for all

Targets

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

Goal 10.
Reduce inequality within and among countries

Targets

10.1 By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average.

10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.

10.3 Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard .

10.4 Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality.

10.b Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular least developed countries, African countries, small island developing States and landlocked developing countries, in accordance with their national plans and programmes

Goal 16.
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Targets

16.6 Develop effective, accountable and transparent institutions at all levels

16.8 Broaden and strengthen the participation of developing countries in the institutions of global governance

16.a Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime

16.b Promote and enforce non-discriminatory laws and policies for sustainable development

Goal 17.
Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Targets

17.1 Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection

17.4 Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress

17.5 Adopt and implement investment promotion regimes for least developed countries

17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge-sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism

17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the Sustainable Development Goals, including through North-South, South-South and triangular cooperation

17.13 Enhance global macroeconomic stability, including through policy coordination and policy coherence

17.14 Enhance policy coherence for sustainable development

17.15 Respect each country's policy space and leadership to establish and implement policies for poverty eradication and sustainable development

17.15.1 Extent of use of country-owned results frameworks and planning tools by providers of development cooperation

17.16 Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries

17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

17.18 By 2020, enhance capacity-building support to developing countries, including for least developed countries and small island developing States, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts

17.19 By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity-building in developing countries

Specific Targets and Goals Connected to Potash and other Mineral Fertilizers

Goal 1.

End poverty in all its forms everywhere

Targets

1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day

1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions

1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance

1.a Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions

1.b Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions

Goal 2.

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries

Goal 5.
Achieve gender equality and empower all women and girls

Targets

5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws

5.c Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels

Goal 9
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries

9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets

9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States

9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities

9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020

Goal 10.

Reduce inequality within and among countries

Targets

10.1 By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average

10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status

Goal 17.

Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

17.1 Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection

17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge-sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism

17.7 Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed

17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the Sustainable Development Goals, including through North-South, South-South and triangular cooperation

17.11 Significantly increase the exports of developing countries, in particular with a view to doubling the least developed countries' share of global exports by 2020

17.16 Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries

17.17 Encourage and promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships

Annex 2: Bibliographic References

References:

African Development Bank (2018) African Economic Outlook 2018, Abidjan: ADB.

Brew Y, Junwu C and Addae-Boateng S (2015) Corporate social responsibility activities of mining companies: the views of the local communities in Ghana, American Journal of International Business Management, 5, 457-465.

Danakali Ltd (2016) Definitive Feasibility Study-Economic Outcomes, Perth: Danakali.

Druilhe Z and Barreiro-Hurle J (2012) Fertiliser subsidies in sub-Saharan Africa, ESA Working paper number 12-04, Rome: Food and Agriculture Organisation.

Gilberthorpe E, Agol D and Gegg T (2016) 'Sustainable mining'? Corporate social responsibility, migration and livelihood choices in Zambia, the Journal of Development Studies, 52,11, 1517-1532.

Global Reporting Initiative (2018) G4: Global Reporting Initiative Guideline 4.

Global Reporting Initiative (2015) Sustainability Reporting Guidelines and Metals and Minerals Sector Supplement.

Global Reporting Initiative (2018) Mining and Metals, GRI Sector Supplement.

Government of Canada (2018) Doing business the Canadian way: A strategy to advance corporate social responsibility in Canada's extractive sector abroad, Ottawa: Government of Canada

Government of the State of Eritrea (2010) Eritrea Population and Health Survey 2010, Department of Statistics and Fafo Institute for International Studies, Oslo.

ICMM (2016) Making a positive contribution to the SDGs- ICMM Guide.

Koussoube E and Nauges C (2016) Returns to fertiliser use: does it pay enough? Some new evidence from Sub-Saharan Africa, European Review of Agricultural Economics, 44,2, 183-210.

Martinik Bosch Sell Pty Ltd (2016) Draft Environmental and Social Impact Assessment, Report prepared for Colluli Mining Share Company (three volumes).

Rodrik D (2007) One economics, many recipes: globalisation, institutions and economic growth, Princeton NJ: Princeton University Press.

Sharma D and Bhatnagar P (2015) Corporate social responsibility of mining industries, International Journal of Law and Management, 57, 5,367-372,

https://doi.org/10.1108/IJLMA-03-2014-0022

Sheahan M and Barrett C (2017) Ten striking facts about agricultural input use in Sub-Saharan Africa, Food Policy, 67: 12-25.

Siyobi B (2015) Corporate social responsibility in South Africa's mining industry: an assessment, Policy briefing 142, Governance of Africa's Resources Programme, SAIIA.

UNDP et al (2016) Mapping mining to the Sustainable Development Goals: An Atlas, Geneva: World Economic Forum.

Wilson DL et al (2016) Avoided emissions of a fuel efficient biomass cookstove dwarf embodied emissions, Development Engineering, 1, 45-52.

World Bank (2018) World Development Indicators Data.

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