



# IMPACT OF MINING EXPLOITATION ON LOCAL COMMUNITY LIVELIHOOD IN RWANDA. “A CASE STUDY OF SAND MINING EXPLOITATION IN RUSORORO SECTOR, GASABO DISTRICT”

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<sup>12345</sup>Faculty of Environmental Studies, University of lay Adventists of Kigali. Kigali city, Rwanda

<sup>1</sup> Jean Paul BIZIMANA	jeanpaulbi85@gmail.com	+250788820561
<sup>2</sup> Martin Vincent NSANZUMUKIZA	nsanzumumartiv@gmail.com	+250789969384
<sup>3</sup> Abias MANIRAGABA	abiasrw@gmail.com	+250783782303
<sup>4</sup> Désiré NIYOMUGABO	dniyomugabo799@gmail.com	+250785454638
<sup>5</sup> Pie NZEYIMANA	nzeyimanapie@gmail.com	+250783515669
<sup>6</sup> Denyse NISHIMWE	denysenishimwe211@gmail.com	+250784449485
<sup>7</sup> Jean Adolphe NKEZABERA	nkezaberaa@gmail.com	+250783260116

## ABSTRACT

Today, a diversity of natural or anthropogenic actors are responsible for both human growth and environmental degradation. The Rusororo sector's contribution to community urban livelihood changes was evaluated in the setting of sandy mining in Kigali city. By identifying the various forms of sand mining that are practiced in Rusororo, evaluating the effects that these shifts have had on community livelihoods, and examining the connection between these two factors. Under 120 households were chosen for the research out of 11,050 households in the Rusororo sector using Yamane's formula. Utilizing surveys and fieldwork, data were gathered. Utilizing both descriptive

and inferential statistics, data analysis was conducted using SPSS 20. The study's findings showed that Rusororo quarries have an adequate supply of thin and small sandy, medium, and large stones, with a mean size of 4.04. With a mean of 4.19 as a strong affinity to the fact that mining exploitation generates income, facilitates the development of small income-generating activities, access to education, and access to health insurance, mining activities in the sector contributed to the reduction of poverty by creating jobs, facilitating infrastructure development, and facilitating industrial use. The relationship between mining exploitation and community livelihood in the community of Rusororo sector has improved significantly, according to the study's correlation ( $r$ ) results, which revealed  $r = 0.674$  and  $p \text{ value} = 0.000$  alpha 0.05. All environmental organizations are advised to take precautions against the negative effects of sand mining, while still operating within industry standards.

**Keywords:** Impact; Mining Exploitation; Community; Livelihood, Sand mining

**Contribution/originality:** This research was conducted to evaluate and highlight the impact that the exploitation of natural resources has on local livelihoods. The data will be used to make decisions and to be better in exploitation of natural resources. It can also serve as the foundation for developing community development policies.

## 1. INTRODUCTION

The world's population is growing, living conditions are rising, and cities are expanding quickly, which all contribute to an increase in sand consumption [3]. Globally, raw materials are typically concentrated along rivers and wetlands, where sand mining has historically been practiced [8]. The gap between production and demand for sand on the global market is getting wider. The top producers are the United States, Germany, and Australia, while the top consumers are China, Singapore, the Netherlands, Japan, and Belgium-Luxembourg [9].

Sand is a resource that is becoming more and more valuable and is essential to the economies of many nations, including Botswana, where sand extraction accounts for about 34% of GDP [15]. [5]. Sand is a crucial resource used in the production of many different products by numerous businesses. Economic development is fueled by sand exports, which also help to create jobs and attract investment to mining regions. The ecosystem is significantly impacted by resource exploitation on a global scale [22]. Additionally, sand mining can lead to societal issues. Alcohol usage is rising, and there are more violent land disputes that sometimes result in fatalities [11]. When the rate at which sand degrades outpaces the rate at which it is produced naturally, environmental issues arise [6]. [20].

In both developed and developing nations, mining produces much-needed jobs and generates money for both local communities and national economies. In addition to the advantages of employment, health care, and education, industry supports ancillary sectors and gives communities infrastructure. However, mining also adds to the deterioration of the global environment. Sand and mining exploitation could not be stopped because the benefits they offer are valued more highly than the harm they do [19].

Sand exploitation was created and transported in Africa for use in industrial and building projects. Sandstone accumulation from mountains to lower laying layers of plateaus appears to be an easily exploitable mineral. This has altered people's living circumstances but has also had a negative impact on the environment, leading to erosion and degrading the land [4][18].

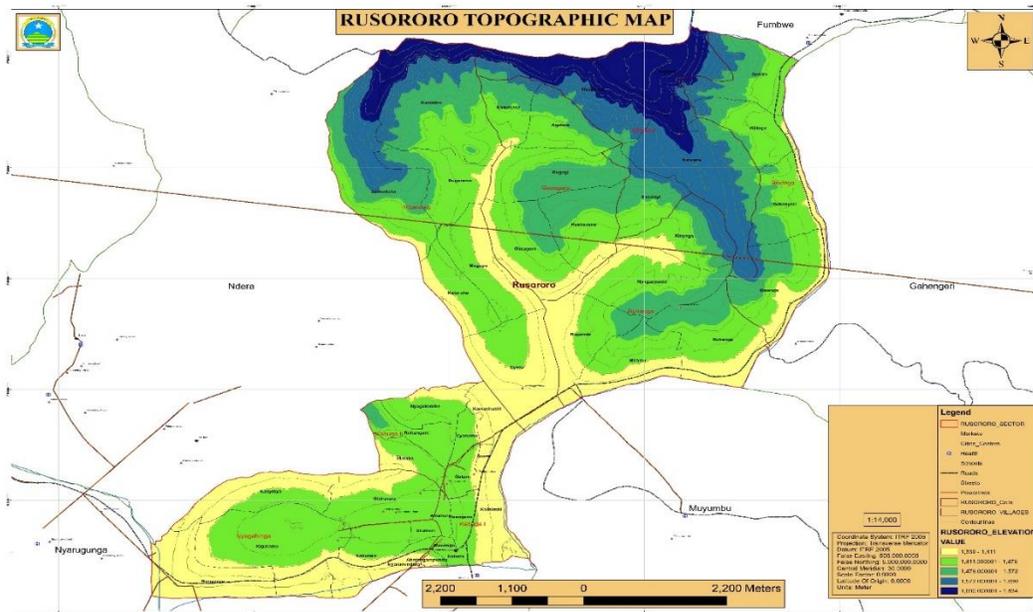
In Rwanda, sand is extracted for use in a variety of ways from the numerous rivers and related wetlands. Many rural residents who reside close to areas where sand, gravel, and stones are discovered engage in sand mining as a significant economic activity [10]. Working in quarries is perhaps the most significant off-farm employment in some locations [13]. Many waterways, along with their tributaries and wetlands, are well known for their ability to extract sand. Rugende Wetland is situated in Kigali City's Rusororo Sector, Gasabo District, primarily [5].

Therefore, this study will clarify to which extent the environment in Rusororo area is affected by sand exploitation in the wetland, especially in the national context where the government is interested in the good management of wetland with the aim of using them to boost agricultural production [17]. The study reflected on assessing the impacts of community based natural resources exploitation to local community livelihood in Rusororo sector, Gasabo district in Kigali city [11].

## 2. Materials and Methods

### 2.1 Description of study area

Rusororo is one of the 15 sectors in the Gasabo District, primarily in Kigali City. It is east of Nyagahinga and north of Kabuga, with a population of 35453 people living there and a population density of 678.8 people per square kilometer. About 400 ha are owned by the mining firm Gasabo Mining Company Ltd, which has been engaged in mining operations for more than seven years. Rusororo is located at an altitude of 1,784 meters and has the coordinates 1° 42' 47" South and 29° 51' 11" East [18].



**Fig.1. Study location of sand quarry in Rusororo Sector.**

### 2.2 Data collection and analysis

This research used primary data from households in the Rusororo sector collected through questionnaires with open-ended and closed-ended questions, as well as secondary data on

Rwandans' means of subsistence and mining literature from the National Institute of Statistics of Rwanda (NISR). The most dependable demographic groups were those who worked in sand mining, sand mining authorities, local government authorities, and people who lived close to sand mining sites with or without businesses. The NISR's estimate of the target population was based on a list of the number of households in each village. Instead of conducting field questionnaire assessments to 10,050 beneficiaries of households in the Rusororo sector, 120 were chosen to represent the entire population in this study using stratified random sampling and the Yamane formula to estimate the actual population for sample size use.

The statistical package for social sciences will be used to process and evaluate the collected data (SPSS 20). The statistical approach made it possible for the researcher to analyze and interpret field data as well as quantify and encode lab findings [7]. The researcher used both descriptive statistics and inferential statistics to meet the study's goals and conduct hypothesis testing. By means of coding respondent impression, classification is based (1: Strongly Disagree, 2: Disagree, 3: Not Sure, 4: Agree, and 5: Strongly Agree). The mean exhibits the widest range of perception for each evaluated object, and the standard deviation gauges how widely values deviate from the mean.

The following conditions helped in decision making, according to Sanders in 2003, the condition on mean took in range of 1.00-2.49 weak, 2.50-3.49 moderate, 3.50-5.00 strong under evaluation decision. The standard deviation; Stdv. <0.5 homogeneity and Stdv. >0.5 heterogeneity of level of spreading. The correlation condition either positive or negative relation,  $r=1$  Perfect linear correlation,  $0.9 < r < 1$  Positive strong correlation,  $0.7 < r < 0.9$  Positive high correlation,  $0.5 < r < 0.7$  Positive moderate correlation and  $0 < r < 0.5$  Weak correlation.

### **3. The results**

#### **3.1 The characteristics of respondents**

In 120 respondents assessed households, 49 of the respondents which equal to (40.8%) were aged between 31 and 41 years old, 40 (33.3%) aged between 41 and 50 years, 21 (17.5%) aged 50 years and above and 10 (8.3%) aged between 21 and 31 years old. By sex among 120 respondents, 76 (63.3%) were male and 44 (36.7%) females.

#### **3.2 The identification of the types of sand mining exploited in Rusororo**

Numerous mining locations in Rwanda produce additional types of sand [9]. Sand in Rusororo is divided into three groups and categorized according to size (silt or very small, medium, and big or coarse sand).



**Fig.2; Type of sand exploited in Rusororo.**

**3.3. Assessment of community’s views on small, medium, and large sand availability**

The researcher has assessed the forms or types of sandy based on needs in Rusororo quarries.

**Tab.1. Sandy category available in Rusororo quarries**

Items assessed	N	Min	Max	SA+A	NS+D+SD	Mean	Stdv.	Comment
In Rusororo sector small (tin) sandy are available in sandy quarries.	120	3	5	84.2%	15.8%	4.18	0.68	Strong Heterogeneity
In Rusororo sector medium sandy are available in sandy quarries.	120	1	5	66.7%	33.3%	3.62	1.45	Strong Heterogeneity
In Rusororo sector big sandy are available in sandy quarries.	120	2	5	90%	10%	4.31	0.91	Strong Heterogeneity
Valid N (list wise)/ Average	120	1	5	80.3%	19.7%	4.04	1.01	Strong Heterogeneity

Source: author survey 2022. N: is the sample size; Min is the minimum choice; Max is the maximum choice; SA+A: Strongly Agree plus Agree; NS+D+SD: Not Sure plus Disagree plus

Strongly Disagree; Stdv.: is Standard Deviation. Codes associated were 1: Strongly Disagree; 2: Disagree; 3: Not Sure; 4: Agree and 5: Strongly Agree.

The results in Tab. 1 showed that small (tin) sandy is available in sandy quarries in the Rusororo sector (mean: 4.18; range: 4 to 5 codes), medium sandy is available in sandy quarries (mean: 3.62; range: 3 to 4 codes), and the majority of respondents confirmed that big sandy is available in sandy quarries with a mean of 4.31; range: 4 to 5.

### 3.4 Impacts of Sand Mining exploitation to Rusororo community

#### 3.4.1 Sand mining exploitation profitability

The survey illustrated that among 120 assessed respondents confirm that Sandy mining quarries in Rusororo sector employee all people's category without any discrimination, the only conditions were willingness to work and physical efforts with a strong mean of 4.28 (4<4.28<5); cooperatives formed employees to local community (mean 3<3.78<4: strong), and there is a coordination of sandy mining exploitation activities in Rusororo sector with local administration, landowners, and tax collectors with mean 4.18 (4<4.18<5: strong). Also, offers jobs to all people's categories from drivers, people working in construction, people extracting sandy from the ground [16]. On side of infrastructure development, sandy exploited from Rusororo sector are mostly used by local people (households in Rusororo and nearby sectors mainly in Gasabo District) with mean of 4.46 (mean 4<4.46<5: strong).

By industry usage, it was found that sandy exploited from Rusororo quarries are useful as inputs for transformation industries developing bricks, this were confirmed with a mean of 4.01 (mean 4<4.01<5: strong). Sandy exploited from Rusororo quarries are useful as inputs for production of decoration materials (mean 4<4.34<5: strong), sandy exploited from Rusororo quarries are useful as inputs for crafts materials sold locally or out of Rusororo sector (mean 4<4.17<5: strong). About development of small income generating activities, women and men have developed small income generating activities like food selling to employees in the quarries (3<3.51<4: strong), employees and people owning land in Rusororo sandy quarries have got finance to expand business activities and feeding families ((3<3.89<4: strong), Rusororo sector area where sandy mining activities operated, were opened, and known to the rest of the sector, and business development was advanced (4<4.07<5: strong). The access to education and health facilities, respondents confirmed that employee in sandy quarrying accessed income to pay schools fees to the relatives and themselves where possible (2<2.78<3: moderate).

Livelihood change due to sandy mining exploitation opportunities, tab.2. illustrated the Distribution of household's monthly income in Rwfs among 120 sampled households, disposable income is the total earned by the active households' members excluding all other charges like taxes, means an income which is ready for household consumption [21].

**Tab.2. Distribution of households by monthly income (Rwfs)**

Income range	Frequency	Percent
Between 50,001 Rwfs to 100,000 Rwfs	6	5.0
Between 100,001 Rwfs to 200,000 Rwfs	20	16.7

Between 200,001 Rwfs to 300,000 Rwfs	13	10.8
Between 300,001 Rwfs to 400,000 Rwfs	20	16.7
Between 400,001 Rwfs to 500,000 Rwfs	21	17.5
Between 500,001 Rwfs to 600,000 Rwfs	13	10.8
Between 600,001 Rwfs to 700,000 Rwfs	13	10.8
Between 700,001 Rwfs to 800,000 Rwfs	7	5.8
More than a million Rwfs	7	5.8
<b>Total</b>	<b>120</b>	<b>100.0</b>

Source: Primary data 2022

### 3.4.2. Impact sand mining exploitation to the environment in Rusororo sector

Extraction of sand has a negative effect on the environment and causes environmental degradation [1]. The method of exploitation, however, determines the degree of environmental deterioration. The Rwanda Mining Board and environmental protection organizations oversee sand mining in Rwanda and offer recommendations for best practices in environmental protection. 92% of the respondents agreed that sand extraction caused soil loss and land deformation, 79% agreed that uncontrolled sand extraction caused soil erosion and the loss of environmental materials, and 88% agreed that poorly managed sand extraction is a vehicle for the transportation of soil materials [24].

### 3.5 Relationship between mining exploitation and community livelihood

Using a bivariate test of significance, the relationship showed how well-informed households in the Rusororo sector were about the importance of or the effects of sandy mining on the improvement of their standard of living. The findings in Tab. 3. demonstrated a Pearson correlation ( $r$ ) of 0.64 and a Sig. in (2-tailed) is 0.000 less than 0.05. signified a substantial improvement in the standard of living for the community as a result of mining.

**Tab.3. Correlations between variables**

		Sandy mining exploitation	Local Community Livelihoods
Sandy mining exploitation	Pearson Correlation	1	0.674**
	Sig. (2-tailed)		0.000
	N	120	120
Local Community Livelihoods	Pearson Correlation	0.674**	1
	Sig. (2-tailed)	.000	
	N	120	120

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS analysis by author

#### 4. Discussion of study findings

The study on forms of sand exploited in the world, illustrated the similar all over the regions but differ in contents and use. They stated 4 types of sand such as very small, small, medium, and large or big sand [14]. While in Rusoro sector sands forms are mainly into three categories small, medium, and large sand. The outcomes in Rusororo survey, where, sand exploitation generates income used to satisfy the needs of households in sector. The relationship between mining exploitation and community livelihood", indicated positive impacts at significant level as source of employment, income, improve social welfare by brought water and electricity in the area and other useful assets for changing community livelihood. The sandy exploitation contributed to community livelihood improvement on 67.4% of sector. The sand mining not only in Rusororo quarries but also all over the world, cause negative effects on the environment [12] mainly, generate soil erosion, floods during rainy season and different agriculture related effects as soil lose its contents. The respondents in Rusororo agreed that sand exploitation led to soil loss on 92%, soil erosion and loss on 79%.

#### 5. Conclusion

The purpose of this research was to determine whether mining activity has an effect on community livelihood in Rwanda and to determine whether that influence is positive or negative and statistically significant. The study and evaluation of the data from the respondents' responses revealed a Pearson correlation (r) of 0.674 and a 2-tailed Sig. of 0.000 less than 0.05. As a result, the researcher has come to the conclusion that there is a positive and statistically significant (moderate) relationship between mining exploitation and an increase in community livelihood. Mining of quarriers are beneficial for the population's socioeconomic growth both directly and indirectly. through the contribution of taxes and jobs to economic growth. The public must be concerned about the negative effects of mining; it is advised to measure and weigh the significance of mining's detrimental effects on the environment.

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