

WASTE MANAGEMENT OPPORTUNITIES AND GREEN ENTREPRENEURIAL DEVELOPMENT IN RWANDA

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ABSTRACT

Waste management has become a growing field that offers entrepreneurial opportunities, room for innovations and investment prospects. However, the most salient problem is meager exploitation of these opportunities in Rwanda. This study entitled “Waste Management Opportunities and Green Entrepreneurial Development in Rwanda” was conducted with the objective of exploring the opportunities underlying waste management in Rwanda, and how their exploitation contributes to the development of green entrepreneurship in Rwanda. The targeted population comprised permanent staff working in recycling and composting companies operating in Rwanda. The sample of 87 respondents was purposely selected from the total population of 656. Questionnaire, interview, and documentation were used to collect data. The test of reliability was done using Cronbach's Alpha coefficient. The treatment of data used descriptive and inferential statistics. The researcher found that there are huge business opportunities in the recycling of paper, metal, plastic, glass and e-waste, as well as briquetting and composting. Despite these opportunities and favorable government policies and regulatory framework, green entrepreneurship in Rwanda was found to grow at a very slow pace. The research hypothesis was tested and it was concluded that there is no significant relationship between opportunities underlying waste management and the development of green entrepreneurship in Rwanda. The challenges faced by green entrepreneurs involved in recycling and composting include mainly high startup capital, and lack of financial support. Recommendations focused on strategies to increase new ventures in this business sector and enhance the capacity of the existing ones.

Key words: Waste, Management, green, entrepreneurship

INTRODUCTION

After several decades of environmental research, it is now rare to find a scientist who disagrees with the notion that humans are severely degrading many of the Earth's ecosystems, and the business sector is often viewed as one of the largest contributors to

environmental degradation (Cohen and Winn, cited by Ivan and Sascha, 2012).

Though the entrepreneur can be defined (by Schaper, cited by Alen and Malin, 2008) as a person who envisions new business opportunities and creates enterprises from scratch often with limited resources and an abundance of risks, it

seems counterintuitive to think of an entrepreneur whose visions of new opportunity include concern for responsible resource use, sustainability, or social responsibility (Allen and Malin, 2008). This entrepreneurial action will be done by a new breed of entrepreneur (green entrepreneur) fusing environmentalism with entrepreneurial spirit, as mentioned by Bell, (cited by Allen and Malin, 2008).

According to Pachaly (2012) several different terms have been used by researchers today, while analyzing the environment and entrepreneurship. Commonly used terms are green entrepreneurship (Berle, 1991), ecopreneurship (Schaper, 2002), eco-entrepreneurship (Schaper, 2002) and environmental entrepreneurship (Keogh and Polonsky, cited by Pachaly, 2012). Schaper (2005) argues that these terms capture the same concept and may be used interchangeably.

As Ivan and Sascha (2012) disclose, the term green entrepreneurship stems from Berle's book "the green entrepreneur", published in 1991. It refers to business opportunities that can save the earth and make money. In his book, Berle (1991) noted how "one man's garbage is another man's treasure".

As Eisenmann(2013) assumes, if an environmentally relevant market failure represents a problem that people would pay to have removed if given a cost-effective solution; an opportunity exists for prospective entrepreneurs. Moreover, by alleviating the market failure, entrepreneurial action contributes to environmental sustainability and social welfare as it enhances the efficiency of markets and helps eliminate economically undesirable environmental degradation.

As Braun (2010) explains, green entrepreneurs are those that identify market opportunities and successfully implement innovative approaches to their products or services with a focus on social or ecological goals by means of profit-oriented business.

According to Detienne (2004), the search of opportunities adopts the ontological perspective that opportunities "exist out there," and it is the job of the entrepreneur to uncover these opportunities. The creation perspective is consistent with the ontological perspective that opportunities are a product of one's mind.

In the words of Linnanen (2002), ecopreneurs (green entrepreneurs) can be classified according to two criteria; first, their desire to change the world and to improve the quality of the environment and

life, and second, their desire to make money and grow as a business venture.

In this regard, various studies (McClelland, 2014; Halstead, 1994; OECD, 2011; Schaper, 2002; etc.) on the green industry including some dynamic approach present a number of green entrepreneurial development indicators, and the most common include employment, number of green firms, green innovation, link to other international initiative, international trade, international financial flows, links to other international initiatives, environmental quality of life, to name a few.

It is in this endeavor that, through EDPRS 2013-2018, the Government of Rwanda will earmark funding and build the institutional capacity to continuously explore the market potential for new green field opportunities, as yet unknown, with the aim of developing a clear value-proposition for investment in Rwanda. Waste management provides huge opportunities for investment prospects in Rwanda. As REMA (2013) reports, between 2007 and 2012, the amount of solid waste grew almost fourfold. Only about 25 per cent of solid waste generated in Kigali is estimated to arrive at the landfill. Electronic waste is growing and is not disposed of properly and some solid waste is still dumped in public areas.

According to REMA (2013), there are some promising initiatives to recycle waste, but organic waste is still an untapped resource. The City must not let garbage and dangerous waste pollute the soil and water, while the emissions that contribute to climate change must be stemmed. Waste discharged from industrial, household, institutional and commercial establishments pose a threat to the city's wetlands.

The World Bank estimates that municipalities in developing countries tend to spend 20 to 50 per cent of their annual budget on solid waste management, but only 40 to 70 per cent of solid waste is actually collected and less than 50 per cent of the population has access to these services (REMA, 2013). As REMA discloses, there are untapped opportunities in green area both small and large scale, including treatment, collection, management and recycling of waste, especially of organic waste whereby about 50 per cent of the population in the city are still lacking access to waste management (Mwai, 2013).

The researcher therefore posed himself the question as to why these opportunities are poorly exploited in Rwanda, and why the research aimed at exploring these opportunities and exposing challenges to green entrepreneurship in waste

management has taken this long to be conducted in Rwanda. It is this vacuum in entrepreneurial research in such an area constituting the life blood of humanity that prompted the researcher to undertake this study in the area of recycling and composting.

On the basis of the problem stated above, the central question to pose at the very outset runs as follows: What is the relationship between opportunities underlying waste management and the development of green entrepreneurship in Rwanda? From this pivotal question, specific questions are derived: What are the opportunities underlying waste management in Rwanda? What is the level of green entrepreneurial development in waste management in Rwanda? What is the intervention of government policies and regulatory framework in fostering green entrepreneurship in waste management? And what are the challenges faced by green entrepreneurs in effectively exploiting opportunities underlying waste management in Rwanda, in the area of recycling and composting? This study revolves thus around the researcher's prior assumptions expressed through the null hypothesis (Ho) formulated as follows: There is no significant relationship between opportunities

underlying waste management and green entrepreneurial development in Rwanda.

RELATED STUDIES

Allen and Malin (2008) identified patterns of social awareness described by green entrepreneurs and how they may be drawn into the natural resource management process, drawing upon case studies of small green businesses to learn how they incorporate their businesses into environmental and social justice causes. The findings revealed innovative models for incorporating green business into environmental causes and natural resource management.

Pacheco et al. (2010) conducted a study to examine how entrepreneurs can escape the green prison, and how entrepreneurship can create opportunities for sustainable development. Green prison was a metaphor they used to refer to how entrepreneurs are compelled to environmentally degrading behavior due to the divergence between individual rewards and collective goals for sustainable development. They found that entrepreneurs can escape from this 'prison' by altering or creating the institutions, norms, property rights, and legislation that establish the incentives of competitive games.

David (2006) investigated into the role that sustainability entrepreneurship may have in engendering a shift in the practices and operations of contemporary capitalism. The paper focused on a subset of sustainable entrepreneurs termed ecopreneurs who seek to combine business practice with sustainable development and so transform their business sectors. The paper suggested that work on sustainable entrepreneurship could be substantially improved by an engagement with the literature on transition management in science and technology studies.

Schaltegger and Wagner (2011) proposed a framework to position sustainable entrepreneurship in relation to sustainability innovation. The framework provided a reference for managers to introduce sustainability innovation and to pursue sustainable entrepreneurship. The paper showed that extant research needs to be expanded with regard to motivations for innovation and those earlier models of sustainable entrepreneurship needed to be refined.

The survey by Patchaly (2012) was conducted to examine SMEs' green activities and allowed for a unique measure of nascent green entrepreneurship. The analysis suggested that nascent green

entrepreneurs may be triggered by providing both financial incentives and support with respect to operational issues that mainly concern the introduction of green products or services. Lack of sufficient public support and insufficient demand were seen as barriers to green entrepreneurship. Lastly, results indicated that with respect to both triggers and the possible removal of barriers there seems to be room for policy action.

As can be noted, all the studies above focused on the role green entrepreneurship can play in sustainable development if they were supported by governments. However, it can be observed that these studies took green entrepreneurship in a broad context. Broadly, green entrepreneurship encompasses various sectors, such as agriculture, ecotourism; landscaping design; biodiesel exploitation; urban farming, organic food delivery services; sustainable travel planning; geothermal developing; to name a very few.

There is therefore need to study each sub-sector because the challenges may vary from one to another. Only very few studies have been conducted on waste management and it is essential to mention some in the following paragraphs.

The United States Environmental Protection Agency (2002) produced a fact

sheet describing the benefits of informal recycling and composting activities and provided steps on how one can incorporate scavenging or waste picking into formal recycling and composting programs. A case study from Brazil showed how businesses organized scavengers and waste pickers into successful recycling cooperatives.

Scheinberg and Pub (2006) investigated into how waste pickers are supported in the ecological modernization of urban waste management systems, and they found that the living conditions and position of waste pickers have changed for the worse.

Umaru(2010) attempted to draw the attention of authorities concerned to the growing importance and contributions of the “*Yan Bola*” recycling enterprise to job creation, tax revenue generation and entrepreneurial development in Nigeria, and the need to integrate it into the mainstream. He demonstrated that the recycling sector, when promoted, could make tremendous impact on income, employment and tax revenue generation as well as value added in an era of high level of unemployment, poverty, misery, want and general low business activity in the mono-cultural economy of Nigeria. The study also showed there is strong evidence to suspect that the ‘Yan Bola business could subtly be at the

vanguard of promoting entrepreneurial development in Nigeria.

Scheinberg et.al.(2011) explored the contribution of informal sector recycling to recycling and solid waste management, and concluded that the approach to analyzing existing recycling can contribute to improvement of solid waste management systems through sustainable and fair recycling.

However, though the above studies took a single focus on recycling subsector, they did not go deep into exploring opportunities underlying waste management in recycling, as well as challenges faced by green entrepreneurs in this sub-sector. This study therefore took a particular focus as it investigated into opportunities underlying green entrepreneurship in waste management, particularly in recycling and composting, and how the exploitation of these opportunities contributes to green entrepreneurial development in Rwanda. It further probed into challenges preventing green entrepreneurs in this sector from effectively exploit these opportunities.

METHODOLOGY

The researcher used as case studies all companies operating in Rwanda whose core activities are recycling and composting. 7 companies were identified, namely COPED,

ECOPLASTIC, STEELRWA, TRUST CO LTD, COCEN, SOIMEX LTD Industries, and Rwanda Plastic Industries. The targeted population comprised all permanent staff working in these companies amounting to 656. The researcher applied Yamane's formula (cited by Clenn, 2009) to determine the sample of 87 respondents from the total population: $n = \frac{N}{1+N(e)^2}$, where n = sample size, N = study population, and e = margin of error. Hence, $n = \frac{656}{1+656(0.1)^2} = 86.7 \approx 87$.

The researcher purposively selected respondents who were assumed to be more knowledgeable than others and more informed about their respective companies given their positions held. The tools for data collection included questionnaire, interview, and documentation.

The questionnaire consisted of closed-ended questions (likert four points scale) and open-ended questions. 87 respondents were all given questionnaires, but 11 among them did not return the questionnaires. That is, they were returned by only 76 respondents. The interview was used as a very useful tool for primary data collection, and the researcher took the opportunity to urge interviewees to speak their minds about what they could not put to pen regarding the opportunities perceived and challenges.

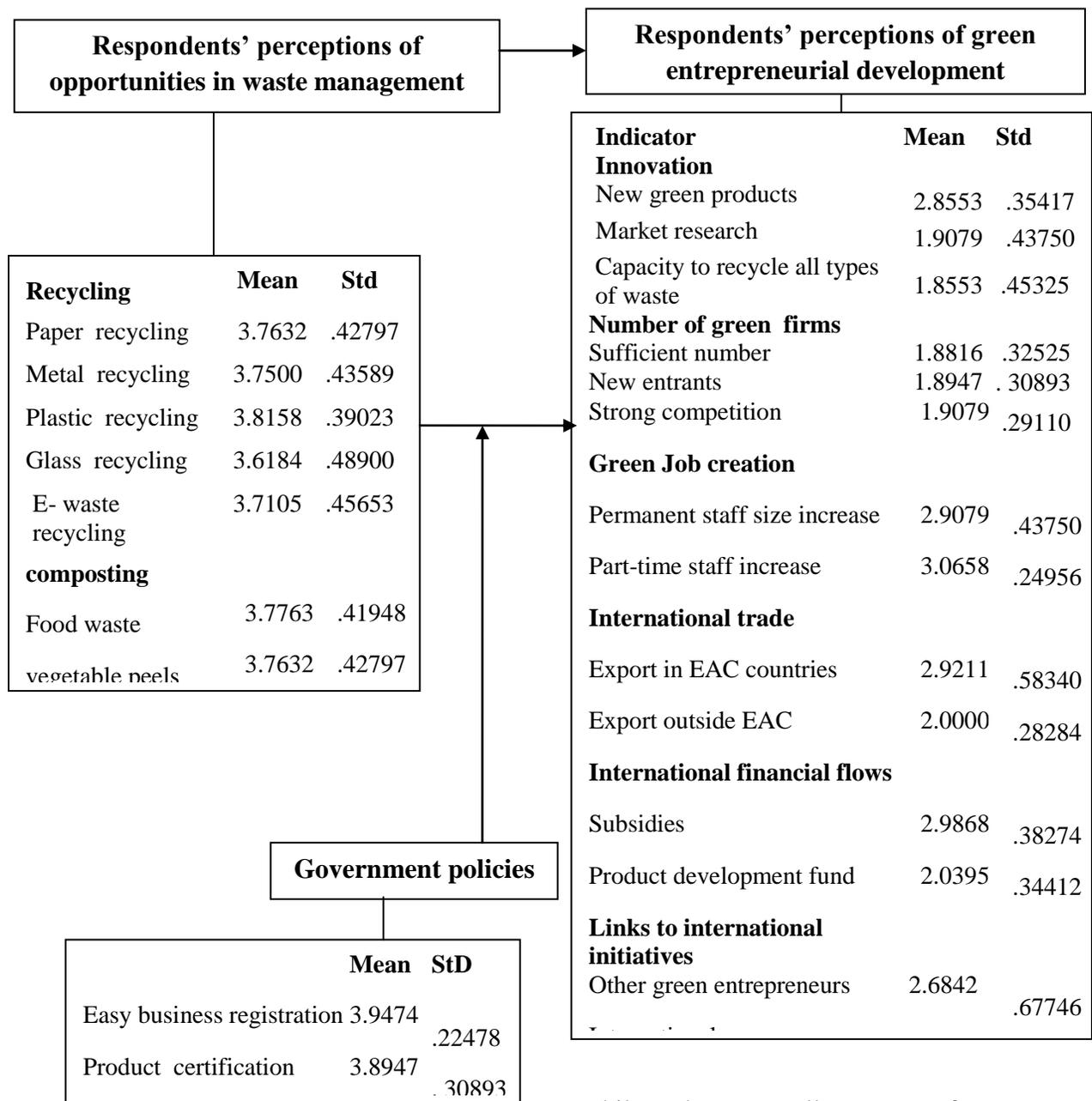
Documentation was also instrumental in collecting secondary data.

The researcher conducted a pilot study on 15 people in two selected companies to test validity and reliability of the questionnaire using Cronobach's alpha, and the coefficient of 0.728, that is, $0.7 \leq \alpha < 0.8$ showed that the internal consistency of the questionnaire was acceptable.

RESULTS AND DISCUSSION

The summary of results using descriptive statistics is presented through the figure below. The interpretation of the mean and standard deviation followed this order: $1 < \text{Mean} < 2.49$: weak; $2.5 < \text{Mean} < 3.49$: moderate; $3.5 < \text{Mean} < 4$: High; $\text{Std} \leq 0.5$: Homogeneity of responses; $\text{Std} > 0.5$: Heterogeneity of responses.

Summary of descriptive statistics results



Source: Primary data, 2014

As results show, the overall mean for waste management opportunities is 3, 7631,

while the overall mean for green entrepreneurial development is 2.3289. It is observed that the mean score for waste management opportunities is high, while the mean score for green entrepreneurial development is low.

In other words, respondents perceive that there are opportunities in waste management, but these opportunities are not effectively exploited, thus slowing the smooth development of green entrepreneurship in recycling and composting. Details on findings about the opportunities assessed and the green entrepreneurial development in Rwanda, as well as the relationship between these variables are well provided in the following paragraphs.

Recycling

As findings disclose, the recycling of paper, metal, plastic, glass and e-waste constitutes huge business opportunities exploitable in Rwanda. Respondents perceive the recycling of paper waste as an opportunity exploitable in Rwanda with a mean of 3.7632; metal recycling with 3.7500 and a standard deviation of 0.43589; plastic recycling with 3.8158 and a standard deviation of 0.39023; glass recycling with 3.6184, and a standard deviation of 0.48900 and e-waste recycling with a mean of 3.710 and a standard deviation of 0.45653. It is noted that all these variables are perceived as high, with homogeneity of responses. That is, respondents have almost the same views on the existence of opportunities in

paper, metal, plastic, glass and e-waste recycling.

The existence these opportunities was also emphasized by some respondents interviewed in these words *“Our Company for example collects waste papers and recycles them into other products, such as JUMBO Rolls, toilet paper, napkin tissue, facial tissues, kitchen towels, pocket tissues, car tissues and medical and these products are widely recognized for their biodegradability and eco-friendly”*.

“Our industry collects iron steel scraps from around the country via association traders and transforms them into steel bars and has a production capacity of 36000 tons annually which allows our industry to cover 80% of the national market of steel bars”.

“The recycling of waste materials such as polythene bags, plastic bottles, and jerry cans cannot only promote a green economy but also the industrial sector. It can also act as an important substitution mechanism because the country needs to save billions of dollars spent on imported products”

“There are a lot of opportunities in plastic waste recycling. For example, we buy plastic scraps from manufacturing companies as well as obsolete and damaged plastic products from individuals, and we recycle them into useful products such as

plastic pipes, plastic jerry cans, plastic buckets and basins, plastic chairs, plastic crates, etc.”

Even though waste glass materials are not recycled in Rwanda due to lack of capacity (as will be seen later on the section about the challenges faced), results from respondents lead to note that there are huge opportunities underlying glass recycling as they said that glass waste materials such as glass bottles can be recycled into fiber-glass, countertops, bottles and jars.

Likewise, no company recycles e-waste in Rwanda as of yet. However, e-waste materials are highly perceived as exploitable opportunities in Rwanda. As the researcher found from interview, the non-exploitation of these opportunities is due to lack of capacity. It is also worth mentioning that, while conducting this study, the researcher learned from The New Times (published in September 2014) that the Ministry of Trade and Industry has disclosed initiatives that seek to improve electronic and electrical waste (e-waste) management in the country. Under the project, a national e-waste management strategy that will support establishment of sustainable recycling industries will also be instituted. According to the Ministry of Trade and Industry, laptops make up 85 per cent of the

total electronic and electrical equipment in public institutions. Of the 15 per cent of the remaining electronic and electrical equipment, 14 per cent are not working. This shows a huge opportunity underlying e-waste recycling in Rwanda.

In addition to the opportunities provided above, responses from an open question which was addressed to respondents in a bid to provide other opportunities they perceived exploitable in Rwanda, most of them provided briquetting. As informed by respondents, another opportunity exploitable in waste management, specifically in recycling is briquetting.

This was also reiterated by respondents interviewed who explained that this activity consists in producing briquettes from municipal solid waste collected from households and restaurants. This waste is separated from metal and plastic. Then the organic material is sorted for making briquettes used for cooking as an alternative cooking and heating source of energy. As it was found, two companies (COCEN and COPED) among the companies under study also produce briquettes in addition to their product lines.

Composting

Similarly, it was found that composting, that is, the transformation of organic waste such as food and vegetable peels are opportunities underlying waste management in Rwanda. It was found that the companies involved in composting are also involved in briquetting whereby the organic material is sorted into two streams, one for briquetting, and another for composting. Organic fertilizer is produced from the organic wet waste materials and briquettes are produced from organic dry waste materials.

As results show, food waste was perceived by respondents with a mean of 3.7763 and a standard deviation of 0.41948, and vegetable peels with a mean of 3.7632 and a standard deviation of 0.42797. That is, most of respondents were of strong opinion that there are opportunities in transforming food waste and vegetable peels into organic fertilizers. This can be justified by the fact that food waste constitutes the biggest proportion among other municipal organic waste as affirmed by REMA (2013) outlook report. This implies that waste of food and vegetable peels embody a huge business opportunity for investment. This was reiterated by the respondents interviewed who perceived composting as one of the most important opportunities

exploitable in the area of agriculture in Rwanda. Given that the biggest majority of the Rwandan population depends largely on agriculture and given the need for using organic fertilizers, there is less doubt that composting appears as one of the most important business opportunities in Rwanda. Otherwise, food waste as well as waste generated through peeling vegetable, if not collected for composting and recycling purposes, will end up in rivers, landfills, and incineration.

Green entrepreneurial development

Further, the level of green entrepreneurial development in Rwanda was assessed on the basis of some indicators of green entrepreneurship development, as seen in the literature, including the level of green entrepreneurial innovation, number of firms created, job creation, international trade, international flow of fund, link to other international initiatives, and environmental condition of life.

Green entrepreneurial innovation

To assess the level of green entrepreneurial innovation, the researcher examined whether the companies under study develop new green products according to customer needs, and whether they conduct market research before the introduction of new green products, as well

as the capacity to recycle all types of waste available under their respective manufacturing specializations.

Respondents perceived new green product introduction within their companies with a moderate mean (2.8553), and a standard deviation of 0.35417, showing homogeneity of responses, implying that the design and development of new products in the recycling industry in Rwanda is neither perceived as being at high nor low level.

It was found that the companies studied seldom conduct market research before introducing new green products. The conduct of market research was perceived with a mean of 1.9079 and a standard deviation of 0.43750, showing homogeneity of responses. As noticed, this mean is weak and this implies that companies under study rarely conduct market research before introducing new green product.

It was also found that the companies involved in recycling and composting do not have the capacity to recycle all types of waste under their recycling specializations. The capacity to recycle all types of waste was given a mean score of 1.8553 (meaning a weak mean score, and a standard deviation of 0.45325, showing homogeneity of responses), which implies that the

companies under study lack the capacity to exploit effectively all the opportunities underlying waste management.

This can be well understood from interview results whereby interviewees revealed that among all types of paper waste, TRUST CO recycles only office papers (duplicata), meaning that it does not recycle other types of paper waste such as textbooks, newspapers, flyers, posters, sticky notes, notebooks, etc. ECOPLASTIC recycles only polythene bags among all plastic waste. That is, other types of plastic waste such as water bottles, rigid plastic products, soda bottles, detergents, cleaner bottles; plastic cups, etc are not recycled. STEEL RWA only recycles steel materials among all types of metals, including Aluminum plate, food cans, soda cans, lids, etc. SOIMEX Recycles plastic bottles, polythene bags, jerry cans, and plastic cups. It does not recycle other types, such as soda bottles, detergents, cleaner bottles, etc. Rwanda plastic industries also recycle plastic bottles, polythene bags, jerry cans, and plastic cups. It does not recycle soda bottles, detergents, cleaner bottles, etc.

This leads to conclude that waste management opportunities in Rwanda are not effectively exploited due to lack of capacities. For example, the researcher

learned from interview that there are some metal scraps which are collected and sold to neighboring countries, such as Uganda and Kenya where they are recycled. Results from interview also revealed that the reason for not recycling all types of waste under their manufacturing specialization is the lack of financial capacity. On this issue, one interviewee said: “it can take about RWF 75, 000, 000 to introduce one product line, and this is very high compared to the number of units needed to recycle at full capacity.”

Number of green firms

Even though the number of firms involved in recycling and composting in Rwanda have been identified (the 7 companies under study), the researcher wished to know whether they are sufficient to fill the gap in the recycling industry in Rwanda; whether there are new market entrants; and whether they are facing any strong competition in the industry.

Respondent perceived the sufficiency of existing recycling/composting firms with a mean score of 1.8816 and a standard deviation of 0.32525, which shows homogeneity of responses. From these data, it is noticed that the mean score is weak; showing that the number of the existing firms within the recycling /composting industry is insufficient. This is also

confirmed by results from interview where interviewees unanimously said that their respective firms cannot satisfy the market demand. One interviewee expressed this issue in these words: “We are not currently able to satisfy the market demand; but we are working out on our strategy to expand our services on national and regional level”. Another interviewee said: “as our organization grows, the demand of our products also grows by manifolds”

Further, respondents view the number of new entrants in the industry with a mean of 1.8947 and a standard deviation of 0.30893, showing homogeneity of responses. As noted from these data, the mean score is weak, which implies that the number of firms entering this business industry is insignificant. One of the reasons for this may be related to an answer provided by one interviewee when asked about challenges they face: “people fear to invest in the recycling business due to huge starting capital required”.

Strong competition within the recycling and composting industry was perceived by respondents as weak (with a mean score of 1.9079, and a standard deviation of 0.29110 showing homogeneity of responses). This is obvious when we look at findings from other items assessed. That is, if there is no

sufficient number of firms in this industry, and when there is no significant number of new entrants, then there will be no strong competition within the industry.

Job creation

On the issue of job creation, the researcher wished to know whether companies under study increase their permanent staff each year, as well as part-time staff. As results show, respondents agree with the increase of permanent staff in their companies with a mean score of 2.9079 and a standard deviation of 0.43750, while the increase of part-time staff is perceived with a mean of 3.0658 and a standard deviation of 0.24956. The mean score for permanent staff increase is moderate with homogeneity of responses, suggesting that companies under study recruit new employees at a moderate level. This is logically consistent with the variable assessed as “new product introduction”. It was found that companies under study introduce new product at a moderate level, and this implies that there must also be new recruited staff for the new product line.

Results also show a moderate mean score for part-time staff increase with homogeneity of responses. Compared to the score given to permanent staff, it is found that the score for part-time staff is higher

than that of permanent staff. As a result from the researcher’s observation, the bigger number of staff is those working in the production unit where laborers are paid on a weekly basis. Results from interview also show that the companies under study recruit new employees, and most of them are part-time workers. One interviewee expressed this as follows: *our company work with associations to collect waste and this contributes to job creation for hundreds of workers*. In other words, the more waste materials are collected for recycling, the more new jobs are created.

International Trade

For international trade, the researcher wished to know whether the companies under study export their products in EAC countries or outside EAC. Results show that the mean score for regular export in EAC countries is 2.9211 with a standard deviation of 0.58340, while the mean score for regular export outside EAC countries is 2.0000 and a standard deviation of 0.28284.

As results show, respondents agree that their companies export regularly their product in EAC country with a moderate mean (2.9211) and a standard deviation of 0.58340 showing heterogeneity of responses. This heterogeneity implies that respondents’ views are dispersed because

not all companies export their products, or at last, on a regular basis. This was clarified through the interview where the companies such as Steel RWA, TRUSTCO and ECOPLASTIC export their products in EAC countries, as they affirmed as follows: “*our company export steel bars in neighboring countries like Kenya, Uganda, South Sudan, Burundi and Eastern Congo*”. Another interviewee said: “*our major market for our products includes Burundi, D.R.Congo, and South Uganda*”, while another added: “*we export plastic sacs called PICs in EAC countries*”.

As for regular export outside EAC countries, results show that respondents’ perceptions provide a weak mean score (2.0000) with homogeneity of responses (a standard deviation of 0.28284). This implies that, apart from those who export in south Sudan and in Congo, as said above, no other country outside EAC was found as customer for the companies under study.

International Financial Flows

As results show, respondents perceive the reception of subsidies from international financial flows with a mean score of 2.9868 and a standard deviation of 0.38274, while the reception of product development financial aid is perceived with a mean score of 2.0395 and a standard deviation of

0.34412. It is shown that the companies under study receive subsidies from international organizations at a moderate level, and the standard deviation provides homogeneity of responses.

Through the interview conducted, the organizations recorded to provide subsidies to companies under study include GroFin, UNEP, World Bank, and UNIDO. As most of respondents interviewed said, the subsidies they receive is too insufficient to bail them out of financial needs faced for successful conduct of their businesses.

As for product development financial aids, respondents perceive this with a weak mean score with homogeneity of responses. Results from interview also confirm this. The majority of respondents said that they seldom receive financial aids from international organization for new product development.

Links to Other International Initiatives

In an attempt to know whether the companies under study are linked to other international initiatives, the researcher assessed their connectivity to other green entrepreneurs in the world, as well as their cooperation with international environmental NGOs. As results show, respondents perceive the connection to other green entrepreneurs in the world with a

moderate mean of 2.6842, and a standard deviation of 0.67746 showing heterogeneity of responses, while the cooperation with international environmental NGOs is perceived with also a moderate mean of 2.6974 and a standard deviation of 0.67369; showing heterogeneity of responses as well. This heterogeneity is due the fact that some companies are connected to other green entrepreneurs in the world, and others are not. Results from interview indicate that some green entrepreneurs have made study trips in other countries, such India to learn from other green entrepreneurs involved in waste management. Some examples of NGOs provided with which these companies cooperate include GEF (Global environment facility), UNEP (United Nation Environment Program), and UNIDO (United Nation for Industrial Development).

Environmental Condition of Life

The researcher was interested in finding out the contribution of the companies under study to improving the environmental condition of life, and asked respondents whether green business activities of recycling and composting have led to considerable decrease of waste pollutants, waste incineration and landfills. As results show, the mean score on how respondents perceive the decrease of waste pollutants is

2.1053, and a standard deviation of 0.38571. The decrease of waste incineration was perceived with a mean score of 2.1053 and a standard deviation of 0.41885, while the mean score for the decrease of landfills was 2.1184 with a standard deviation of 0.43103.

It is noted that the mean scores are weak, meaning that respondents perceive that waste continues to pollute the environment, and incineration activities continues to take place, as well as land filling, even though there are companies involved in waste management. However, responses from interview on the contribution of composting/ and recycling companies converge into reduction of waste going to landfills, incineration, and rivers but at a smallest extent.

Government Policies and Regulatory Framework

As per the third question of the study, the researcher attempted to know how the companies under study view the existing government policies and regulatory framework in the conduct of their green business activities. In this endeavor, the researcher inquired about facilitation in green business registration, product design certification, and about whether these policies and regulatory framework provide them with moral incentives in the conduct of

their business activities. As results show, respondents perceive the government facilitation in business registration with a mean of 3.9474 and a standard deviation of 0.22478, facilitation in product design certification with a mean of 3.8947 and a standard deviation of 0.30893, and moral incentive provided by existing policies and regulations with a mean of 3.9079. It is noted that all the mean scores are high and responses are homogeneous.

This means that respondents view the procedures for registration of their green businesses as easier, and they perceive existing government policies as creating moral incentives in their business activities. One interviewee witnessed this in these words: *“the environmental government policy is favorable for us who are doing this kind of business. I was given all I needed to start my business including easy registration, and licensing”*. Another said *“since the plastic ban by the government of Rwanda for environmental concern, I was facilitated to turn plastic waste into useful products through certification of my alternative products as green”*.

Inferential statistics

To answer the pivotal question of the study, the correlation between waste management opportunities and green entrepreneurial development was measured by means of inferential statistics.

Spearman’s rank order correlation coefficient (ρ) was used whereby: $\rho = 1$: Perfect correlation; $0.9 \leq \rho < 1$: Strong correlation; $0.7 \leq \rho < 0.9$: High correlation; $0.5 \leq \rho < 0.7$: Moderate correlation; $\rho < 0.5$: Weak correlation; $\rho = 0$: Absence of correlation. Correlation results between perceived opportunities in waste management and green entrepreneurial development in Rwanda are presented through the table below:

Correlation

		Waste Mgt Opport.	Green Entrep. Dvt
Spearman's rho	Correl. Coef.	1.000	.071
	Sig. (2-tailed)	.	.540
	N	76	76
	Correl. Coef.	.071	1.000
	Sig. (2-tailed)	.540	.
	N	76	76

It was found that the relationship between waste management opportunities and green entrepreneurial development in Rwanda is weak (with a correlation coefficient of 0.071).

The researcher found that p-value (0.540) was greater than the alpha (0.05), and the researcher failed to reject the null hypothesis. It was therefore concluded that there is no significant relationship between the opportunities underlying waste management in Rwanda and the development of green entrepreneurship in Rwanda. This was therefore consistent with the declaration made by African Development Bank (2013) that there is untapped potential for entrepreneurship in the area of management and utilization of waste, which has high potential for business, resource efficiency and climate change mitigation.

To answer the last (but not least) question of the study, the researcher investigated into challenges faced by green entrepreneurs in recycling/composting through interview. The common challenges evoked included high startup capital, lack of regular staff training in waste management, lack of public awareness about waste valorization and lack of financial support to expand green business activities.

As the interviewees said, recycling industry requires huge technological investments which translate into high capital needed for starting the business. As told by interviewees, investors fear to invest in the recycling industry because of the high initial capital investment required.

Further, the majority of respondent interviewed expressed the need to enhance the capacity of their staff in terms of regular training. Here is the example of one interviewee expressing this need: *“We need training to be provided to our team on a timely basis to keep it abreast with the upcoming market trends and process methodologies”*. From this point of view, considerable efforts should be devoted for the mobilization and training of the manpower, for the acquisition of new knowledge and know-how, and for informing employees about new green technologies and services and their market potential.

Though the majority of interviewees said that they try to sensitize the community about waste valorization, they need more support for the voices to resonate across the country. Here are statements from interviewees: *“we are doing our best to sensitize the community about waste valorization, and we are helping the people*

of Kigali city to change mindsets and behavior about waste so as to keep our city more cleanly, but the challenge we still face is that the public is not aware about the usefulness of waste valorization". Another interviewee said: *the sensitization is done from door to door or site to site about the collection system".* As they said, customers are educated how to sort their waste into 3 categories, using three colors of bins. That is, green bins for organic or biodegradable materials, blue bins for recyclable materials such as plastic, metal, glass bottles, paper, cartons, and black bins for non recoverable waste like mixed/disposable rubbish. But the major problem they face is the capacity to reach out to all communities.

As for financial support interviewees expressed the need for funding the expansion of their business to satisfy the market demand. On this issue, one interviewee said: *"the big challenge include lack of funding for more trucks to expand our business into other parts of the country".*

This may be justified by the fact that there are few companies involved in waste management, and most of them are concentrated in KIGALI CITY. One may also think of the other cities around the country which have no access to waste

management. As a result, municipal waste generated ends up in rivers, incineration, landfill, hence, causing harm to the environment.

Conclusions

Through this study, it was empirically confirmed that waste management, especially in the recycling and composting industry offers huge entrepreneurial opportunities, room for innovations and investment prospects. It was demonstrated that waste management constitutes huge potential, and provides numerous business outlets in various areas, such as paper recycling, plastic recycling, glass recycling, metal recycling, e-waste recycling, briquetting and composting.

Despite this huge potential buried in waste, the level of green entrepreneurial development in Rwanda is still low. Though the government of Rwanda has laid the groundwork for fostering green entrepreneurship through favorable policies and regulatory framework, the sector was found to grow at a very slow pace.

Even though these policies have proved to provide more of moralizing support whereby green entrepreneurs involved in recycling and composting take pride in what they do, more tangible support is needed as

it was found that most of the challenges faced are material wise. In other words the intrinsic motivation provided through existing policies and regulatory framework should go hand in hand with extrinsic motivation provided through material support.

Given their laudable endeavors and commitment demonstrated by the audacious discovery of the opportunities underlying waste management and starting their environmentally oriented businesses through risk taking, they would make tremendous progress if they were fully supported. This would play a considerable impact on the environmental protection considered as the life blood of the humanity through natural resource conservation and climate change mitigation, thereby moving Rwanda to sustainable green economy.

Recommendations

On the basis of the research findings, and given the role green entrepreneurship can play in the environment protection and green economy of Rwanda, it is worth formulating a set of recommendations addressed to different stake holders in the field of green entrepreneurship:

First and foremost, the government of Rwanda should put in place and implement strategies in the following areas:

- Increasing new startups through financially and technically supporting business projects in the recycling and composting industry.
- Supporting financially and technically expansion projects for existing companies involved in recycling and composting.
- Providing regular staff training in the recycling and composting industry.
- Increasing public awareness about waste valorization.

Second, there should be joint partnerships including NGOs and banks to support companies involved in recycling and composting. Thirdly, companies involved in recycling and composting should devise expansion strategies, and present their projects to different environmental oriented institutions, both at local and international level.

Suggestions for Further Research

This study is the first of its kind to be conducted in the area of green entrepreneurship in Rwanda. It serves to pave the way and lay the groundwork for further green entrepreneurial studies. As entrepreneurship is nothing else than acting upon opportunities, the researcher focused on waste management opportunities, but

there are other areas worth of research, such as assessing opportunities underlying green entrepreneurship in ecotourism, landscaping; organic farming; to name a few.

It is also worth mentioning that even the area of waste management in the area of recycling and composting has not been exhausted. This research was only the tip of the iceberg. There are other areas left to be explored in deep, such as:

- Econometric study of the impact of recycling industry on the green economic growth of Rwanda;
- Factors influencing green entrepreneurship in waste management in Rwanda;
- Role of the informal sector in waste management in the development of green entrepreneurship in Rwanda; to name a few.

References

African Development Bank.(2013). *Green Growth: Industrial Waste Management and SME Entrepreneurship Hub in Egypt*. [Online]. Available at www.afdb.org. [Accessed on 16/09/2014].

Allen, G., Malin, S. (2008). Green Entrepreneurship: A Method for Managing Natural Resources? *Society and Natural Resources*, (21)828–844, Routledge, Taylor & Francis Group, LLC.

Berle, G. (1991). *The Green Entrepreneur: Business Opportunities that Can Save the Earth and Make You Money*. Blue Ridge Summit, PA: Liberty Hall Press.

Clenn, D. (2009). *Determining sample size*. [online]. Available at <http://edis.ifas.ufl.edu/PD006>. [Accessed on 04/05/2014].

David, G. (2006). *Sustainability Entrepreneurs, Ecopreneurs and the Development of a Sustainable Economy*. *Greener Management International*, 55(16), pp. 63-78.

Detienne, D., Chandler G.N. (2004). Opportunity Identification and its Role in the Entrepreneurial Classroom: A Pedagogical Approach and Empirical Test. *Academy of Management Learning and Education*. Vol. 3(3), pp. 242–257.

Eisenmann, T. (2013). *Entrepreneurship: A Working Definition*. [Online]. Available at <http://blogs.hbr.org/2013/01/what-is-entrepreneurship/>. [Accessed on 05/05/2014].

Halstead, J. (1994). Waste management and job creation. Madison: University of Wisconsin, Department of Agricultural Economics.

Ivan, M., Sascha, K. (2012). Green entrepreneurship: definitions of related concepts. *International Journal of Strategic Management*. 12(2), pp1-12.

- Keogh, P.D.; Polonsky, M.J. (1998). Environmental Commitment: A Basis for Environmental Entrepreneurship, *Journal of Organizational Change Management* 11 (1), pp. 38-49.
- Linnanen, L. (2002). An Insider's Experiences with Environmental Entrepreneurship, *Green Management International*, 38, pp. 71-80.
- McClelland, C.L. (2014). *Green Jobs in Waste Management*. [online]. Available at <http://www.dummies.com/howto/content/green-jobs-in-waste-management.html>. [Accessed on 12/10/2014 .
- Mwai, C. (2013). National Report reveals untapped business opportunities in environment sector. [Online]. Available at <http://www.newtimes.co.rw/news>.
- Naudé, W. (2008). Entrepreneurship in Economic Development, *World Institute for Development Economic Research, UNU-WIDER*, Research Paper No. 2008/20.
- OECD. (2011). *Measuring Green Entrepreneurship*. [online]. Available at <http://dx.doi.org/10.1787/9789264097711-4-en>. [Accessed on 20/10/2014].
- Pachaly, M. W. (2012). *Barriers and Triggers to Green Entrepreneurship: An exploratory study*. Rotterdam: Erasmus University Rotterdam.
- Pacheco, D.F., Dean, T.J., Payne , D.S, (2010). Escaping the green prison: Entrepreneurship and the creation of opportunities for sustainable development. *Journal of Business Venturing*, 25(5), pp 464-480.
- REMA. (2013). *Kigali State of Environment and Outlook Report*. [Online]. Available at www.rema.gov.rw. Accessed on 02//03/2014.
- Schaltegger, S., Wagner, M. (2011). Sustainable entrepreneurship and sustainability innovation: categories and interactions. *Business Strategy and the Environment*, 20(4), pp. 222–237.
- Schaper, M. (2002). The essence of eco-entrepreneurship. *Greener Management International*, 38, pp. 26-30.
- Schaper, M. (2005). *Making Ecopreneurs: developing sustainable entrepreneurship*. Hampshire, UK: Ashgate Publishing Limited.
- Scheinberg, A., Pub, A. J.(2006). Slim pickin's: Supporting waste pickers in the ecological modernization of urban waste management systems. *International Journal of Technology Management & Sustainable Development* , 5 (3), p257.
- Scheinberg, A., Sandra, S., Simpson, M.H., Mol, A. (2011). Assessing urban recycling in low- and middle-income countries: Building on modernised mixtures. *Habitat International*, 35(2), pp. 188–198.
- Umaru, I. (2010). Recycling of Solid Waste and the 'Yan Bold' Underground Economy: A Survey of Environmental Entrepreneurs in Central Nigeria. *Journal of Human Ecology*, 30(1), pp. 45-54.
- United States Environmental Protection Agency. (2002). Public Private Partnership in Solid Waste Management in Municipal, Solid Waste and Emergency Response. [online]. Available at www.epa.gov/globalwarming. [Accessed on 21/07/2014].