Exploring Ways of Reducing Carbon Footprints in Clothing Care and Maintenance among Tertiary Students in Ghana

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***Abstract*-** Students clean their garments to eliminate dirt and to prevent them from smelling. Although often ignored, every load of washing and drying contributes to environmental consequence on tertiary campuses with extensive use of water, energy, detergents, and chemicals. The study thus investigated the existing patterns of student laundry application and the environmental implications of these practices. The sample used for this study were tertiary students in Ghana. Convenience sampling was used to select 150 students and administered with questionnaires. The major findings of the study demonstrate that one of the main problems with laundry as it stands is the lack of education about the environmental impacts of doing laundry. Students do not connect doing laundry with the number of resources necessary to make their clothes clean. This is especially true when considering detergents and the number of students who haphazardly pour detergent when cleaning their clothes.

***Index Terms*-** Garment, Carbon Footprints, Clothing Care and Maintenance

I. INTRODUCTION

Concerns regarding climate change have increased beyond the range of scientists and environmentalists and have permeated the general public. Although using washing machines as well as dryers is a practical and time-saving method of caring for clothes, it is also an energy, water, and chemical-intensive process that extends the ecological footprint with each load of wash. Saving energy and water also decreases pollution, acid rain, water and air pollution, and safeguards inadequate local water resources in many communities (Consumer Reports, 2007).

Students clean their garments to eliminate dirt and to prevent them from smelling. Most students wash or clean and maintain their clothes after using them only once, whereas others wash them rarely. Although often ignored, every load of washing and drying contributes to environmental consequence on tertiary campuses with extensive use of water, energy, and chemicals. Carbon footprints of clothing care and maintenance among tertiary students are the cause of a notable amount of environmental degradation and human diseases. All the organic substances present in the wastewater from laundry activities are of immense concern in water treatment as they react with various disinfectants particularly chlorine. Chemicals dissipate into the atmosphere we breathe or are absorbed through the skin and becomes allergic reactions.

Controlling carbon emissions and measuring the carbon footprint is a challenge for many institutions today (Butner et al. 2014). Carbon footprints of clothing care and maintenance contribute to anthropogenic climate change. A considerable percentage of carbon footprints of clothing care and maintenance a is due to laundry related activities. Waste management in clothing care and maintenance is responsible for producing hundreds of thousands of tonnes of greenhouse gas emissions every year, and these figures do not include other human activities that contribute to carbon footprints. With the addition of these amounts, they can be safely assumed to increase the overall carbon footprint for clothing care and maintenance far beyond the estimations of anyone.

The introduction of different detergents, bleach, softeners and so on can result in a dramatic increase in greenhouse gas emissions created through laundry methods such as using the washing machine. As Harbus (2008) inferred, depending on how one does it, and how many loads one gets through each week, laundry can contribute a surprising amount to carbon footprint. It is said that fashion is the second largest polluter, this is likely impossible to know, what is definite is that fashion carbon footprint is unbelievable. Washing and drying a load every two (2) days creates around 440kg of CO_2 every year, which is commensurate with flying from London to Glasgow and back with a15-mile taxi trip to and from the airports (Berners-Lee 2011).

Berners-Lee (2011) infers that for a typical 40°C wash nearly three-quarters of the carbon footprint comes from the drying, which follows the common rule of thumb that the more energy an appliance generates, the more energy it needs to operate. Part of the quandary is that tumble dryers such as washing machines utilize electricity to produce their heat. This is ordinarily more than double the carbon-intensive as generating heat from gas. All the above and more necessitates the need to investigate the existing patterns of student laundry application and distinguish the environmental implications of these practices and offer recommendations on how tertiary students can reduce their environmental impact while keeping their clothes clean.

Specifically, the study explored ways of reducing the carbon footprints in connection with clothing care and maintenance practices among tertiary students in Ghana.

II. RELATED WORK

The range of definitions for carbon footprint

Several definitions of the term carbon footprint exist Growcom (2008). These descriptions are nonetheless grounded primarily on publications from "grey" rather than scientific literature. Notwithstanding a large number of publications, these articles mainly concentrate on measuring and decreasing greenhouse emissions of distinct processes and products and do not sufficiently address more basic definition concerns. The inadequacy of scientific literature on the conceptual interpretation of a carbon footprint is contradicted by the awesome quantity of information obtainable on carbon footprints in the public domain.

The lack of scientific literature on the theoretical connotation of a carbon footprint suggests some amount of discrepancy between the popularised understanding of a carbon footprint and the scientific processes typically associated with peer-reviewed journals. One author noted that it is conceptually incorrect to measure a carbon footprint in tons of CO2 because footprints are spatial indicators, measured in hectares or square meters (Hammond 2007). Hammond hence asserted that a more appropriate term would be "carbon weight." Similarly, Wiedmann & Minx (2007) infer that an estimation tool that includes the measurement of greenhouse gases in addition to CO2 would be more appropriately called a "climate footprint" rather than a "carbon footprint." Nevertheless, the obvious absence of scientific approval has not limited the growing application of this term in communications by the government, the media, and institutions.

Some definitions of a carbon footprint in the literature

i. Carbon footprint measures the demand on biocapacity that rises from combusting fossil fuels regarding the volume of forest area needed to separate these CO2 emissions (Global Footprint Network 2007).
ii. The term carbon footprint is generally employed to specify the total volume of CO2 and other greenhouse gas (GHG) emissions for which a person or entity is responsible. Footprints may further be calculated for events or products (Carbon trust 2008).
iii. Carbon footprint is a measure of the particular total volume of CO2 emissions that directly and indirectly come about due to an action or is accumulated over the life phases of a product (Wiedmann & Minx 2007).
iv. A measure of the volume of CO2 emitted through the burning of fossil fuels; in the instance of an institution or company, it is the CO2 emissions that result from their daily operations; in the case of a person or household, it is the CO2 emissions that occur as a result of their everyday actions; for a product or service, it involves further life-cycle CO2 emissions along the supply chain; for materials, it is a measure of the integrated CO2 emissions ascertained through life cycle evaluation (Carbon N Zero 2008).

Due to the absence of a globally affirmed description of a carbon footprint, a diversity of alternative terms has been formed to describe related theories or processes. Such terms encompass "greenhouse gas accounting" by Forsyth & Oemcke (2007).

The Units of Measurement

Categorizing the units of measurement of a carbon footprint necessitates that a position is reached on two fundamental questions. The first relates to the distinction between an ecological footprint and a carbon footprint. Thus, must the measurement of a carbon footprint be expressed in tons of gaseous emissions or in area-based units tied to the natural regenerative capacity of the environment? (Growcom 2008). Assuming that a carbon footprint is measured in tons of gaseous emissions brings about a second definition issue: must the measurement of a carbon footprint be in tons of CO2 or must it be extended to comprise a diversity of greenhouse gases articulated in tonnes of CO2 equivalents? To comprehend this subject, a deeper perception of tools and mechanisms to decrease greenhouse gases, as established in international agreements like the Kyoto protocol, is needed.

The Kyoto protocol is a constitutionally binding international agreement among signatory countries to the United Nations Framework Convention on Climate Change (UNFCCC) to decrease greenhouse gases and of the stabilisation of anthropogenic greenhouse gas emissions. According to the Kyoto protocol, there are six (6) main greenhouse gases with the potential to cause climate change, each with a different global warming potential (Kyoto Protocol 2008). For the ease of reportage, the warming effect of CO2 has been allotted a worth of one, while the global warming potential of the other greenhouse gases are applied to translate the non-carbon dioxide gases to CO2 equivalents (CO2-e) (Carbon N Zero 2008). The warming potential of all of these gases over 100 years is depicted in Table 1.

Table 1: global warming potential of different greenhouse gases covered in the Kyoto Protocol

Gas	*Warming potential*	*Source*
Carbon dioxide	1	Mainly from fossil fuel use
Methane	21	Mainly from ruminant animals & organic waste
Nitrous oxide	310	Mainly from agriculture
Hydrofluorocarbons	140 to 11,700	Mainly from refrigerants
Perfluorocarbons	9,200 to 6,500	From aluminum production
Sulphur hexafluoride	23,900	Mainly from the electricity industry

Clothing definitions

Woodward (2009) infers that clothing unifies roles with regards to identity, sexuality, and sociality, and thus clothing choices externalise the inner self in social contexts. Consequently, clothing is very intimate, close to our body, but also very closely connected to our external social roles and simultaneously our inner self, our identity. Kaiser (1990) notes that clothing can be understood through its temporal, fashion and aesthetic aspects, i.e., its cultural context, and through connections to group affiliation, social situation, immediate body space, personal characteristics, kinetic interaction and garment/body interaction.

Entwistle (2000) describe clothing as mean an embodied experience that is socially constituted and situated: i.e., the dress, the body and the self in the social context are perceived simultaneously. Breward (2000) elucidates that some objects can be defined to be the extenders of identity since they are so fundamentally profoundly associated with an individual. Clothing is one example of such a product. Appearance and clothing express the wearer's inner self, moods, and identity. Furthermore, clothing is connected to social class, status, gender, and age. Clothing is very intimate; it exposes and hides simultaneously.

McCracken & Roth (1989) indicates that clothing is an expressive medium and points out that clothing can be understood as a language or at least as a communication medium. Kaiser (1990) defines appearance communication as 'meaningful exchange of information through visual personal clues' (p. 11). Since appearance is constantly evaluated in social and temporal contexts, the identity construction process makes the appearance and clothing changes unavoidable. As Kaiser (1990) notes, these statements of who we are or are not or no longer are, are possible to coexist with ambiguous identity spaces that are under construction' (p. 43). Temporal symbolism means that objects' symbolic meanings change over time (Miller 1997).

Carbon footprints and clothing in general

Clothes have a long and complicated life cycle consisting of various stages from raw material to final disposal (Allwood et al., 2006). However, the care phase of the clothing lifecycle has the most substantial overall negative impact on the environment according to Fletcher, (2008). The clothing life cycle starts with the selection of raw materials. After pre-treatment, the textile fibers are spun into yarns. The yarns are then knitted or woven into fabrics. After dyed, cut, sewed, trimmed and decorated, the fabric is finally turned into the finished garments. The finished garments are packed and shipped from the production factories to the distribution outlets. As noted by Ryttinger & Holtmaat (2014), the use, care, and maintenance stage happen once consumers purchase the garments and begin wearing them. During the consumer use stage, the garments are washed, dried and ironed. Finally, the garments are discarded when consumers no longer need them.

The growing popularity of fast fashion, including rapid production, short lead time, and cheap materials, has stimulated consumers to purchase garments at a higher speed. However, cheap fabric and poor garment construction force consumers to discard them shortly, shortening the lifetime of a product (Fletcher 2010). Furthermore, the apparel and textile industry creates significant environmental and social footprint at each stage of the product lifecycle including fibre growth and manufacturing, dyeing and finishing, transportation and distribution, washing and drying, and ultimate disposal (Fulton & Lee 2010).

Clothing care and maintenance practices

What individuals know and what they think they know is often different, and this is applicable with regards to laundering. According to Mowen & Minor (2006), "consumer knowledge is defined as the amount of experience with and information that a person has about particular products or services" (p. 64). Information comes to individuals through many facets that it is difficult for them to know what is truthful. "Green-washing" is an example of false knowledge retrieved from an outside source. Green-washing occurs when false claims are made to exploit green consumers. This can happen purposefully from various companies, although individuals can get incorrect information from other sources that do not know they are giving false information such as friends, family, and internet sites.

Many people accept as true that a product is better for the environment if the packaging includes environmentally friendly terms, although this is not necessarily true (Spack et al. 2012). Green-washing demonstrates how easily buyers can be manipulated. The word 'green' has become such an umbrella term that its actual meaning is not always clear to patrons, and green product perceptions do not necessarily translate into purchasing behaviour (Spack et al., 2012). The most common ways for patrons to learn about washing machines are through the internet and appliance stores. Consequently, the internet does not always provide accurate information. As online consumer reviews typically highlight the problems of an appliance rather than the positive attributes (see Hustvedt et al., 2013).

This may deter consumers from purchasing a machine that otherwise meets their needs. With regards to laundry, consumers are typically not as knowledgeable as they think they are. People tend to follow 'general norms' in their everyday lifestyle tasks as inferred by Jack (2013). Individuals are rarely aware of the fibre content of their clothing, even though clothing is required to be labelled with this information. With this chosen ignorance, buyers frequently assume their laundry is primarily cotton and wash it as so, often and with high temperatures. Sorting of laundry is usually done on the basis of colour, rather than fibre type, which can ruin clothing and also use additional water and energy (see Fletcher & Goggin, 2001).

Laundering behaviours are continually changing and developing with social, cultural, and moral norms. Recent changes in social norms have led to an increase in laundry and personal hygiene (see Laitala et al., 2012). The increase in demand for cleanliness has come with the increased demand for energy, water use, and detergent consumption. This has also led to laundry being carried out in smaller loads more frequently. Laitala et al. (2012) stressed the need for consumers to improve their laundering behaviours by using low wash temperatures, using eco-program

settings, filling the machine to capacity, decreasing washing frequencies, and using the correct detergent dosages.

Many individuals wash clothing habitually after every use without ever evaluating its soil (stain) level. Since laundry is done as a habit, many people are unnecessarily washing clothing and using resources. Laitala et al. (2012) found that men and older people tend to wait longer between washing which is helpful in reducing carbon footprint, although that is not their motivation. Laundry is frequently generated out of laziness according to parents involved in a study by Gram-Hanssen (2007). Teenagers would instead put clean clothing back into a laundry bin rather than taking time to fold, sort, and put them away.

Even though many individuals change and wash clothing daily (Gram-Hanssen, 2007), some products are typically washed less than others such as towels and jeans. Most agree that underpants should only be used one day before washing, but woollen sweaters can easily be worn more than ten times before washing. The number of laundry loads can be reduced with better utilisation of the size of the washing machine (Conrady et al., 2013). The most typical reason for not using a dryer is to protect the clothing from damage not to prevent carbon footprint (Braun & Stamminger, 2011).

The electricity and water use from laundering in homes varies by the technology of the machine, the number of washes, the wash temperature, and the size of the load. Many consumers indicate that they would like to reduce their environmental impact but not at the cost of extra effort or money or if it conflicted with other goals and values. Failure to follow instructions on care labels can also have lasting effects on clothing which eventually leads to higher clothing consumption. The impacts of ignored instructions may include colour loss, shrinkage, deformities, and other quality degradations of clothing.

When consumers disregard instructions, potential savings are lost for fibres that do not require frequent washing. Consumers not only ignore instructions written on their clothing, but there are also studies that show consumers ignore instructions on other laundering products. In their research, Laitala et al. (2012) found that only 12% of their participants accurately followed the detergent instructions and used a measuring cup while doing laundry.

Similarly, some consumers from a study in Germany actually use the same amount of detergent for every cycle despite the size of the load or the soil level of the garments (Conrady et al., 2013). Although it is vital not to use too little detergent to ensure proper cleaning, overdosing detergents greatly increases the quantity of chemicals in the wastewater that goes back into our water supply (Fijan et al., 2008). The correct dosage of detergent does influence the cleanliness of clothing (Conrady et al., 2013). A recent study in Norway suggests that detergent labelling can be improved to help consumers in this aspect as previously mentioned.

By giving more accurate information about dosage to use according to the hardness of water, dirtiness of laundry, and size of the washing machine, consumers may be more likely to stop overdosing. Consumers may also be more likely to purchase detergents with eco-labelling (Jarvi & Paloviita, 2007), though environmental claims that are more specific are perceived more positively than general claims (Spack et al., 2012). Many people depend on product packaging for information on how sustainable a product is and how the product should be utilised.

Buyers actually regarded detergent packaging information as the most important source of information for product sustainability. Eco-labeling has been intended to help consumers purchase products that are less harmful to the environment, although, as previously noted the terms are often misunderstood or have no significant meaning (Jarvi & Paloviita, 2007). Use of fabric softener has an impact on the level of laundry behaviour. Fabric softeners are not considered sustainable due to the chemicals added to the wastewater after use. In a study by Laitala, et al. (2012), indicated that individuals reported using fabric softener as a means of scenting their laundry. The study went on to prove that laundry treated with fabric softener became malodorous sooner than non-treated laundry. Hence, using fabric softener not only contributes to water pollution and additional product consumption but also may cause consumers to wash their clothing more frequently than if they had not used the fabric softener at the beginning (Laitala et al., 2012).

Behavioural change in relation to the environment has proven to be difficult unless a clear and direct financial incentive is applied, even if the consumers are aware that consumption affects the energy supply which in turn affects prices of energy (Hustvedt, 2011). Consumers must link their own behaviour to environmental and social impact in order to motivate a behavioural intention change (Bhamra et al., 2011).

III METHODOLOGY

In this study, both descriptive and exploratory research design was chosen to investigate the effects of clothing care and maintenance practices on carbon footprints among tertiary students in Ghana. This study adopted the quantitative methodology. Quantitative research as inferred by Saunders et al. (2012) provides clear statistical data for inference and supports larger sample sizes which translate to more generalizability over the population being studied. Again Creswell (2014) notes that one benefit of the quantitative approach is that the outcomes are valid, reliable and generalizable to a more significant population. The quantitative approach was selected based on the nature of the study and its methodological foundation. This investigation attempts to explore the everyday life of tertiary students behaviour in terms of their approaches to clothing care and maintenance in their natural setting. The study involved only a limited sample of tertiary institutions in the country as a result of limited tertiary institutions offering higher fashion education. This limitation might affect the generalization of the findings but might nevertheless provide valuable information on carbon footprints

of clothing care and maintenance practices on the various campuses. Convenience sampling was used to select 150 students from various institutions and administered with questionnaires.

III. RESULTS

Carbon footprints associated with clothing care and maintenance practices among tertiary students

Table 2: Carbon footprints of clothing care and maintenance practices

Descriptive Statistics					
	N	**Min.**	**Max.**	**Mean**	**±SD**
Laundry accounts for about one-quarter of the carbon footprint of clothing	160	0	5	3.82	1.218
Not following clothing care instructions in labels carefully and thoroughly	160	0	5	4.23	.984
Ineffective laundry machines	160	0	5	4.06	1.137
Heating up wash water	160	0	5	4.21	1.078
Not using detergents that work in cold water	160	0	5	4.08	.997
Usage of harmful detergents and bleach	160	0	5	4.06	1.100
Total average	**160**	**0**	**5**	**4.07**	**1.08**

1=strongly disagree 2=disagree 3=neutral 4= agree 5= strongly agree

Table 2 provided a presentation of the means and standard deviations of respondents' views of carbon footprints of clothing care and maintenance practices. From the table it could be observed that the majority of the respondents agreed that laundry accounts for about one-quarter of the carbon footprint of clothing (M=3.882, SD=1.21), not following clothing care instructions in labels carefully and thoroughly (M=4.23, SD=.984, ineffective laundry machines (M=4.06, SD=1.137), heating up wash water (M=4.21, SD=1.078), not using detergents that work in cold water (M=4.08, SD=.997), and usage of harmful detergents and bleach (M=4.06, SD=1.100) are some of the approaches to clothing care and maintenance that impacts the environment. From the trend of the responses, it can be concluded that the tertiary students are aware of the fact that laundry and the failure to clothing care instructions in labels account for about one-quarter of the carbon footprint.

Table 3 gives a presentation of the best practices in clothing care and maintenance for reducing carbon footprints. Responses were measured on the range "to a very large extent" to "not at all." From the table, chlorine bleach is known to be extremely toxic to the environment hence its use must be reduced to a very large extent according to 40 respondents representing 25%. While 53 respondents representing 33.1% indicated to a large extent, 40 respondents 25% indicated to some extent, 16 respondents representing 10% indicated to a less extent whiles 11 representing 6.9% indicated not at all (M=3.59, ±SD=1.16). From the results, it can be determined that the tertiary students recognise that chlorine bleach is acknowledged to be very toxic to the environment hence its use must be reduced.

Again, respondents were asked to indicate the extent to which they agree or otherwise with the notion that clothes must be designed for easy recycling. From the results, it could be observed that 61 constituting 38.1% of the respondents indicated that clothes must be designed for easy recycling to a very large extent. Again, 43 respondents representing 26.9% indicated to a large extent, 35 representing 21.9% indicated to some extent, 15 representing 9.4% indicated to a less extent whiles six representing 3.8% indicated not at all (3.59, SD=1.16). From the mean and standard deviation statistics, it could be inferred that the surveyed tertiary students recognise that designing clothes that are recycle-friendly can be a sure way to reducing carbon footprints.

More, the respondents were also asked whether environmentally-friendly detergents should be used for doing laundry. Summary of the responses points out that about half (n=84, 52.5%) of the respondents indicated that environmentally-friendly detergents should be used to a very large extent. While 41 representing 25.6% indicated to a large extent, 31 representing 19.4% indicated to some extent whiles four representing 2.5% indicated to a less extent (M=4.28, SD=.863). From the responses, it can be concluded that to reduce carbon footprints environmentally friendly detergents should be used to a very large extent.

The responses were asked to indicate the extent to which clothes should be worn in order to reduce carbon footprints. From the responses it could be observed that nearly half (n=76, 47.5%) of the respondents asserted clothes should be worn 2 or 3 times before washing to a very large extent, 45 representing 28.1% indicated to a large extent, 24 representing 15% indicated to some extent, 12 representing 7.5% indicated to a less extent, three representing 1.9% indicating not at all (M=4.12, SD=1.04). The outcome of the responses implies that to reduce carbon footprints on the environment clothes to a very large extent have to be washed only after 2 or 3 of wearing them.

Also, respondents were asked to indicate the extent to which clothes must be designed to reduce chemical impacts when washed as a practice of reducing carbon footprints. As can be seen in Table 4.6 the results show that more than half (n=85, 53.1%) of the respondents asserted that to a very large extent, clothes must be designed to reduce chemical impacts when washed. Meanwhile, 43 making up 26.9% of the respondents indicated to a large extent, 22 representing 13.8% indicated to some extent, seven representing 4.4% indicated to a less extent whiles 3 representing 1.9% indicated not all. Mean statistics (M=4.25, ±SD=0.978) on the item revealed that the students believe that to a very large extent clothes must be designed to reduce chemical impacts when washed. That notwithstanding, it can be concluded from the results that fabric manufacturing companies should do well to reduce the chemical composition of the clothes they produce so as to reduce its impact on the environment when washed.

Best Practices for reducing carbon footprints associated with clothing care

Table 3: Best practices for reducing carbon footprints

Statement	Responses					Mean	SD
	5	4	3	2	1		
Chlorine bleach is acknowledged to be very toxic to the environment hence its use must be reduced	40 (25)	53 (33.1)	40 (25)	16 (10)	11 (6.9)	3.59	1.16
Clothes must be designed for easy recycling	61 (38.1)	43 (26.9)	35 (21.9)	15 (9.4)	6 (3.8)	3.86	1.14
Environmentally-friendly detergents must be used	84 (52.5)	41 (25.6)	31 (19.4)	4 (2.5)	0	4.28	.863
Clothes should be worn 2 or 3 times before washing	76 (47.5)	45 (28.1)	24 (15)	12 (7.5)	3 (1.9)	4.12	1.04
Clothes must be designed to reduce chemical impacts when washed	85 (53.1)	43 (26.9)	22 (13.8)	7 (4.4)	3 (1.9)	4.25	.978
Clothes must be designed to reduce energy and water use	67 (41.9)	54 (33.8)	32 (20.0)	7 (4.4)	0	4.11	1.00
Clothes to be washed should be sorted out on the basis of the fibre type. (cotton, woollens, silks & synthetics; whites should be washed separately from coloured ones)	76 (47.5)	39 (24.4)	31 (19.4)	14 (8.8)	0	3.98	1.05
Very dirty clothes should be washed separately	66 (41.3)	43 (26.9)	36 (22.5)	12 (7.5)	3 (1.9)	4.13	1.065
Care labels on clothes must be read and followed thoroughly	80 (50)	39 (24.4)	27 (166.9)	10 (6.3)	4 (2.5)	3.42	1.40
Sponging can be done sometimes	52 (32.5)	27 (16.9)	38 (23.8)	22 (13.8)	21 (13.1)	4.32	.927
Modest changes across clothing life-cycles could reduce each of the carbon footprints	40 (25)	52 (32.5)	46 (28.8)	14 (8.8)	7 (4.4)	3.65	1.08
Total Average	66 (37.5)	44 (27.5)	33 (20.6)	12 (7.5)	5 (3.1)	4.00	1.06

1= not at all 2= to a small extent 3= to moderate extent 4= to a large extent 5= to a very large extent

However, concerning designing clothes to reduce energy and water use suggested that the majority (n=67, 41.9%) of the respondents believe that clothes must be designed to reduce energy and water use whereas 54 constituting 33.8% of the respondents indicated to a large extent, 32 making up 20% asserted to some extent whiles seven representing 4.4% indicated to a less extent (M=4.11, ±SD=1.00). From the results, it can be determined that the to reduce carbon footprint on the environment to a very large extent close must be designed to reduce energy and water use.

Again, on the subject of sorting clothes for washing, the results suggest that almost half (n=76, 47.5%) of the respondents asserted that to a very large extent clothes to be washed must be organised out on the basis of the fibre type to a very large extent, 39 representing 24.4% indicated to a large extent, 31 representing 19.4% indicated to some extent whiles 14 representing 8.8% indicated to a less extent. From the mean statistics (M=3.98, SD=1.05) gives the impression that most of the tertiary students accept that as a practice geared towards reducing carbon footprint clothes has to be organised out on the basis of the fibre type.

Also, another practice that was asked of the respondents was for them to indicate the extent to which washing should be done to reduce the carbon footprint on the environment. Summary of the responses shows that about one-fourth (n=66, 41.3%) of the respondents maintained that to reduce the impact to a very large extent clothes should be washed separately, whereas 43 comprising 26.9% indicated to a large extent, 36 representing 22.5% indicated to some extent, 12 representing 7.5% indicated to a less extent whiles 3 representing 1.9% indicated not at all (M=4.13, ±SD=1.065). From the results, it can be inferred that to curtail the impact of the effect of carbon footprints filthy clothes should be washed separately.

Again, the respondents were requested to specify the extent to which care labels on clothes must be read and followed as a way of reducing carbon footprints. From the responses, it could be observed that just about half (n=80, 50%) affirmed that to a very large extent care labels on clothes must be read and followed thoroughly. Meanwhile, 39 comprising 24.4% of the respondents indicated that to a large extent, 27 making up 16.9% to some extent, 10 representing 6.3% indicated to a less extent whiles four representing 2.5% indicated not at all (M=3.52, ±SD=1.40). From the responses it can be concluded that to reduce carbon footprint on the environment individuals should read and follow thoroughly care labels on clothes.

Finally, when asked about again regarding practices to reduce carbon footprints on the environment about one-third (n=52, 32.5%) of the respondents affirmed that to a larger extent there have to be modest changes across clothing life-cycles could reduce each of the carbon footprints. Additionally, 40 (25%) of the respondents also noted that to a very large extent to that effect. However, it is worth noting that 10 (6.3%) of the respondents stated to a rather small extent modest changes should be made across clothing life-cycles. Mean and standard deviation statistics on the item showed (M=3.65, ±SD=1.08) gives the impression that more must be done to ensure that carbon footprints and its impact on the environment are reduced.

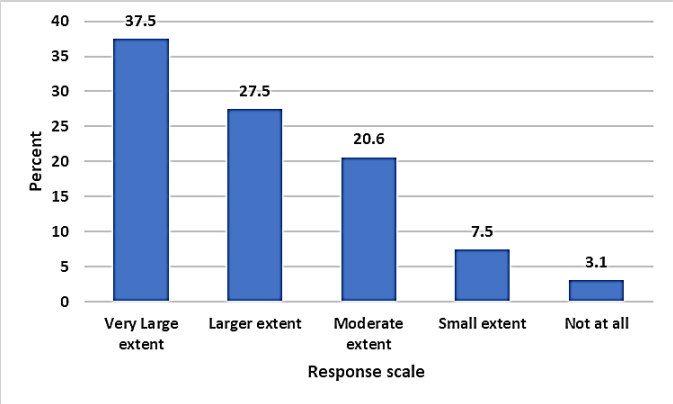

Figure 1: Summary of responses

In summary, 66 respondents representing 37.5% strongly agreed to various carbon footprints control practices, 44 representing 27.5% agreed, 33 representing 20.6% remained neutral, 12 representing 7.5% disagreed whiles five representing 3.1% strongly disagreed. The mean score was 4.00 indicating that majority of the respondents agreed to these practices as they apply to carbon footprints control. From the summary, it could be observed that to a larger extent more efforts need to be done to reduce the effects of clothing care and maintenance on the environment.

CONCLUSION

Students are aware of the fact that laundry and the failure to read clothing care instructions labels account for about one-quarter of the carbon footprint. From the results, it can be resolved that tertiary students recognise that chlorine bleach is acknowledged to be very toxic to the environment hence its use must be reduced. Students also recognise that designing clothes that are recycle-friendly can be a sure way of reducing carbon footprints. From the responses, was concluded that to reduce carbon footprints environmentally friendly detergents must be used to more. Further, the outcome of the responses implies that to reduce carbon footprints on the environment clothes must be washed only after being worn for 2 or 3 times. In order to limit the impact of the effect of carbon footprints, very dirty clothes must be washed separately. Also, to reduce carbon footprint on the environment, individuals must read and follow thoroughly care labels on clothes and more has to be done to ensure that carbon footprints and its impact on the environment are reduced.

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